University of Lapland
Faculty of Art and Design
Master's Programme in Arctic Art and Design

Inside out

Exploring invisible spaces of material flow through a Critical Design process

Master's thesis
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May 2019
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“Design must become an innovative, highly creative, cross-disciplinary tool responsive to the true needs of men. It must be more research oriented, and we must stop defiling the earth itself with poorly designed objects and structures. “

Victor Papanek (1971, x)

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Name of the pro gradu thesis: Inside out. Exploring invisible spaces of material flow through a critical design process
Author: Anu Corin
Degree programme: Arctic Art and Design
The type of the work: Master's thesis
Number of pages: 75
Year: 2019

Abstract: This thesis is a creative exploration of sustainability and design, investigating different aspects of materiality and how critical design could be used as a method for understanding the material flow and identifying value opportunities. Through a collaboration project between University of Lapland and Westenergy, waste-to-energy plant located in Western Finland, the thesis is identifying invisible spaces of material flow and discussing how they could be communicated, made visible and understood.

By studying the link between human, material and environment, the aim is also to understand how to work as a designer in this changing world. The thesis is describing the complex issue of creating for sustainability, thus discussing the role of design in shaping a sustainable future. The study is drawing on design research methodology, supported by reflexive research and practice-based approaches such as workshop. Through identifying patterns, topics and themes in the data, the analysis is recognizing opportunities for communicating transparency. The collaboration project is including three creative processes, each building on the previous one, functioning as a vehicle for the research.

The study argues that a reason to environmental alienation is that parts of the material flow are hidden to most people and therefore difficult to trace. These gaps could be visualized and understood through methods of critical design. The thesis is opening up the possibility for further research on how critical design could be applied as a service design method and on developing activities directed to design for sustainability.

Key words: Design, Service design, Materiality, Sustainability, Critical design, Design education, Waste management, Circular economy, Workshop

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1 Introduction

1.1 Overview

Combining fields of sustainability and design thinking this thesis is exploring aspects of materiality and the role of design in shaping a sustainable future. By studying the link between human, material and environment, the aim is to understand how to work as a designer in this changing material world. The thesis is describing the complex issue of creating for sustainability, which according to Anusas and Ingold (2013, p. 61) is both an aesthetic and political question. This is why I consider using critical design as a means to discuss the issue (Malpass, 2017). I am interested in how critical design could be used as a method for understanding the material flow and identifying value opportunities. The thesis is opening up the possibility for further research on how critical design could be applied as a service design method and on developing activities directed to design for sustainability.

The literature review is built on theories about materiality and sustainability, reflecting on the ideas of for instance Tim Ingold, William McDonough and Michael Braungart, Matt Malpass, Anthony Dunne and Fiona Raby. By connecting to political discussions about waste management and energy production, the literature review is linking the personal struggle of a designer to a much bigger context of material use and power structures. The literature review is taking a design perspective, but recognizing design in its broadest sense as continuously expanding.

This thesis is a creative exploration of sustainability and design, placed within meta-design, an emerging field concerned with designing design itself and seeds for change (Tham, 2014). Drawing on design research methodology and supported by practice-based and reflexive approaches, the qualitative small-scale study is including three creative processes, each building on the previous one. The practice is functioning as a vehicle for the research, which is aiming to deepen the understanding of the subject by generating reflection through a questioning process. Through being transparent in the personal considerations while put in relation to theoretical background and practical examples, the thesis is providing a rich description of the subject. My hope is that a personal reflexive approach will make the issue relatable to other design practitioners. Through the practice-based approach the thesis is

reaching people outside the academia and the cross-disciplinary process is also contributing to areas outside art and design. This chapter will give a more detailed description of the research topic and purpose, its potential significance, framework, research questions and limitations.

1.2 Topic and purpose

In the middle of enormous technological development and climate change, we are facing massive transformations on every level. Yet, in this changing world, we are learning that everything is interlinked and to be able to design a product or a service, we need to understand the systems where it will function. Design itself is also transforming, from designing products we are moving to designing services, systems, experiences, meaningful connections, relationships, values, new narratives, processes of change and paradigms (Chapman, 2015; Thackara, 2015; Manzini, 2015; Caccavale & Shakespare, 2014; Tham, 2014; Buchanan, 1992).

On a personal level, this thesis is a continuation on my mission to research sustainability and how to work as a designer in sustainable ways. The term "sustainability" presents several challenges on the design discipline (Tham & Lundebye, 2008), which is traditionally driven by mass-production, industry related development and consumption and where the environmental and social issues are to a large extent connected with overproduction and overconsumption (Chapman, 2015; Fletcher, 2013; Fletcher & Goggin, 2001; Naess, 1989). My struggle is to see the role of a maker in a world where precious materials, such as for example oil and water, are wasted and products are being produced when there is no real need for them. With a background in clothing design, my concern is mainly coming from the field of textile. The textile industry is one of the most polluting industries in the world and deeply relying on consumerism (Fletcher, 2014), which makes it hard to see how to function within it, without creating more harm. In the fashion industry obsolescence is not necessarily due to a the product being damaged, but it quickly becomes obsolete on a symbolic level, when it is no longer transferring the right message (Tham & Lundeby, 2008). However, also perfectly functioning electronic devices are quickly becoming irrelevant, when new versions appear on the market (Chapman, 2008).

My concern is that the modern consumption behavior is evidence of a bad relationship with the environment. We fail to follow the environmental consequences of our material use, because the beginning and the end of the material life cycle is invisible to most of us (Anusas & Ingold, 2013; Fletcher, 2013). This is why my research is aiming to trace the material flow to witness and communicate the invisible spaces of it. The motivation is coming from a mainstream environmental concern and goes beyond the personal level.

Recognizing the power of design in shaping our world, I am interested in exploring the link between human, environment and material. I believe that if engaging with natural systems will increase our appreciation of nature, perhaps engaging with manmade structures will increase the appreciation of the materials and objects around us. Therefore it is interesting to consider if a tacit understanding of sustainable solutions could help us to steer the attention to creating a sustainable future. With this in mind, the research started when the opportunity to collaborate with a waste-to-energy (WtE) plant dropped in my email. The process lead me to identifying gaps in my own understanding of material flows and recognizing the same gaps in how our society is constructed. I used critical design as a method to "inquire into matters of concern" (Malpass, 2017, p. 1-2). Critical design functioned as a questioning process, which did not demand solutions as an end result, but allowed me to rethink current practices and explore the context. However, it is important to highlight that the critique is not directed at the WtE-plants actions, but rather at design, society itself and my own actions. I tried to answer why it is important to create a conversation about WtE -plants and what are the areas we should focus on, through investigating my own relationship to material and relation to WtE-plants.

Through taking a critical approach, my intention is to highlight growth and development opportunities. Critical design gave the method and theory for researching the context and develop my own thinking as a designer. The process led me to an understanding that to practice how to think critically can help in discovering issues and to rethinking solutions, which are not limited by our previous experiences and understandings. In this thesis, the purpose is not to produce art or design, but rather to expand the understanding of a phenomenon and explore opportunities to design for a sustainable future through a creative questioning process. Questioning current practices is the first step of imagining alternative futures, and imagining an alternative future is the first step of creating it (Tham, 2014; Fletcher, 2013).

1.3 Potential significance

This thesis is part of the Master's Programme of Arctic Art and Design at University of Lapland. According to Tahkokallio (2012) the culturally and environmentally fragile Arctic area has the potential to function as a test lab for sustainable practices. Through the programme it is possible to practice a holistic understanding of what it means to create for sustainability. With a specific focus on the challenges in the Arctic area, it aims to develop a sensitivity to context (Coutts, 2012). Arctic design offers the possibility to learn from the Arctic area about sustainable practices and adapt them to other contexts. Agreeing with Hardt (2012, p. 57-59) I consider that it is not arctic design, unless it is sustainable. However, through the thesis I wish to show the potential of critical design in the context of arctic design and I would like to argue that arctic design is not sustainable unless it is critical. Critical design has the potential to provide guidance for decision making and develop a professional growth in the designers way of thinking (Tham, 2014; Jakobsone, 2017).

The thesis is also placed in the field of service design, which recognizes that design can be more than designing an object. According to Troncon (2011, p. 317) service design offers a new aesthetic for design, which is considering immaterial qualities, such as context, relationships, experiences and feelings, breaking old views of design for consumption. My interest lies in our relationship to material, including both material and immaterial aspects. I am interested in how we can communicate through our material choices. Thus exploring how a critical object can be used as a technique to define and mediate meaningful context and how can a process be a used as a critical design object (Holmid, 2009, p. 89). This thesis is contributing to these areas of interest, by concentrating on expanding the understanding of how critique could be implanted systematically into the design process to deepen the understanding of a phenomenon.

Supported by a collaboration project with a Waste-to-energy plant the thesis has potential to reveal hidden meanings through critical design and recognize the role of art and design in communicating transparency. By identifying, pointing out, naming and discussing gaps in our understanding of the material flows, the thesis can be of benefit in the context of circular economy. The collaboration offers a pilot study of how and why customers and visitors could be included in the communication efforts, and why it is important to make the unseen

structures of our material flow, such as waste management, visible to the public. My hope is that the workshop contributed to a deeper intellectual understanding of waste management and a growing emotional understanding of material flow, by engaging with all senses.

I consider that the thesis is relevant to design practitioners working in the field of design for sustainable futures. The aim is to provide a description of the social and environmental issues, focusing on issues of waste management, materiality and how to design for a sustainable future. The thesis is not aiming to solve a problem but rather to describe it and create possibilities for further action.

1.4 Framework and general research questions

Anusas and Ingold (2013) argues that the reason why we have a bad relationship with our environment, is because the material flow is to a large extent invisible to us, which is why we fail to follow and understand the consequences of our consumption behavior. In other words, on an intellectual level, we understand where the material is coming from and where it is going. However, because we cannot see it, we fail to understand it on an emotional level. The same issue can be seen in how we understand climate change - intellectually we know that it is happening, but because we cannot see it, we don't believe it or refuse to act on it. This hypothesis is at the heart of the thesis, linking it to several environmental issues, such as waste, pollution and climate change. Many researchers are recognizing the link between material form, environmental sustainability and perception, thus identifying the opportunity to create a change through rethinking form and through shedding light on silenced and hidden problems.

This study will focus on deepening the understanding of the relationship between human, material and the environment, through the design perspective. My goal is to explore hidden meanings of material, through a critical design process.

These questions will guide the research:

- To what extent can design contribute to creating a relationship to the environment? What is the role of perception when it comes to understanding environmental issues and acting on them? How can invisible spaces of material flow be made visible? How can design actively encourage people to engage with sustainable futures?
- How are the objects around us affecting our daily life? How can the concept of waste be understood and what does its future look like? To what extent can an artefact and material be part of a conversation and contribute to communicating sustainability?
- How can critical design help us understand the material flows and identify value opportunities? What is the value of critical design? How could critical design be used in a service design process?

My approach to these questions is explorative, aiming to develop an understanding about the complex issues through a practice-based approach. My intention is to draw attention to invisible spaces of material flow. These spaces include for example energy sources and waste management plants, which are normally located outside cities and to most people beyond reach of everyday interaction.

The research is following the principles of a qualitative research while connecting to the field of design research. Data is gathered through practice-based methods such as workshop and observation, and it is collected in the form of photography, video and fieldnotes. The research builds on a collaboration project with a waste-to-energy -plant and the methodology is designed in three cycles of data inquiry: a workshop, a photo series and a textile installation. Through the cycles I have been investigating questions of inclusion, transparency, communication and material choices, leading to recognizing the need for further investigation and discovering the opportunity to develop the use of critical design within the context of service design.

The research was mostly done alone, which also placed certain limitations. Self-reported data might be more bias, compared to data reported by others. This aspect has been dealt with through an openly reflexive approach and by recognizing that the research is highly subjective. If I have experienced something, it is likely that others have experienced the same thing. The study is contributing to a higher understanding through a reflexive qualitative approach, not through quantitative means. Therefore it is also impossible to say whether or not critical design

can contribute to a higher understanding for others than for myself. However, the value could lie in the personal and professional growth for designers, which is why critical design could be of benefit within the educational context.

1.5 Limitations

This thesis is discussing design for sustainability and specifically targeting the problem of creating. The focus lies on pointing out educational opportunities of tacit experiences when designing for sustainability, through drawing on critical design and learning how to think critically in the decision-making process of a designer. Realizing the potential to systematically include practices of critical thinking into design education, the thesis is also including the point of view of young elementary school children, with the hope of making a bigger impact on the ones that will create the future.

Social design is not included, though it could bring a deeper level into the discussion. As social design could be considered to for example work with marginalized groups through organizations, striving to bring forth voices that might not generally not be heard in the society. This thesis could rather be placed in design for social innovation, which according to Manzini (2015, p. 64) “deals with all kinds of social change toward sustainability”. The thesis is also including discussions about material flows. Through a collaboration with a waste-to-energy plant (WtE-plant) the aim is to work from inside out and point out some invisible parts of the material flow and why it is important to create awareness of the energy plants practices. The collaboration is limiting the study to discussing the role of a WtE-plant, not the role of for example recycling or sorting waste. The focus is on developing the communication efforts and on pointing out how art and design can mediate sustainability and materialize and represent complex issues.

2 Literature review

This chapter is focusing on reviewing literature connected to the problem of creating. I will look at the issue from three different angles: material flow, material culture and critical design. The problem of creating is a contradiction within design for sustainability, where for example environmental problems are typically addressed by creating more objects. Material and energy efficiency is dealt with, but the root cause to ecological crisis is continuously overlooked (Chapman, 2008; Manzini, 2008) However, designers are in the position to make decisions about the objects around us, through constantly rethinking form. This is why I have chosen to look at the issue from a design point of view.

Firstly, I will be focusing on reviewing literature on environmental relations, looking at questions of environmental alienation and if it is possible to design a relationship to the environment. Suggesting to create a deeper connection to the material world, through systematically making the invisible parts of the material flow visible (Anusas & Ingold, 2013; Heidenreich, 2009). Thereby, considering the role of perception when it comes to understanding environmental issues and acting on them.

Secondly, I will explore the changing relationship to objects and material culture. Humans are fixated with objects, and it is deeply rooted our way of thinking (Anusas & Ingold, 2013; Troncon, 2011). However, ideas about circular economy are challenging us to rethink the material forms and flows, artifacts, systems and relationships (McDonough & Braungart, 2002), while raising questions about if waste will exist in the future. Through a constructivist viewpoint, I am interested in if an object could be part of creating a new narrative about our material environment.

Thirdly, I will be focusing on critical design, which is functioning outside design for consumption, striving to create discussion. The critique is directed towards design itself, questioning assumptions, patterns of behavior and beliefs. However, critical design is often misunderstood and thus losing some of its potential. Yet, such a process has potential to contribute to professional growth opening up opportunities to develop design education and design for sustainability (Malpass, 2017; Jakobsone, 2017). This chapter is discussing the history, methods, potential and critique of critical design, pointing out a potential to contribute to design thinking and service design practices.

2.1 Designing environmental relations

This chapter is including brief reviews about environmental alienation and broken systems which are appearing through the invisible spaces of material flow, while also covering ideas about how things could be made visible. I will discuss environmental relations from a design aspect and look deeper into the question if environmental issues such as waste, pollution and climate change can be considered direct evidence of environmental alienation. I am interested in if people have lost the connection to their environment and if they have, what could be done to rebuild the relationship, thus the question is if an environmental relation could be designed. Several researchers have recognized the connection between human, environment and perception, claiming that the reason to our environmental alienation is the lack of perception of the technical structures that process the natural material into products of use. The focus is on these invisible spaces of material flow that exists between the societal and natural world (Anusas & Ingold, 2013; Heidenreich, 2009). Through considering reasons and impact of the unseen spaces, the study is pointing out gaps in our understanding and discussing ways how these gaps could be visualized, exhibited, exposed and materialized. Thereby, the aim is to investigate how design can actively encourage people to engage with sustainable futures.

2.1.1 Environmental alienation and broken systems

Chapman (2015, p. 1-4) claims that ”one does not need to be an ardent environmentalist to see that there is little or no logic to the way we relate to our environment” as it is so easy to find horror stories about the ways humans are treating nature. This chapter will not be about repeating those horror stories, but rather focusing on admitting that they exist and briefly reviewing some reasons to them.

According to Naess (1989, p. 2-3) humanity is “inseparable from nature”, but “for the first time in the history of humanity, we stand face to face with a choice imposed upon us because our lackadaisical attitude to the production of things and people has caught up with us”. In other words, he argues that humans are part of nature, but through our own actions we are separating ourselves from nature. The environmental crisis is critical, because of “an

exponentially increasing, and partially or totally irreversible environmental deterioration or devastation perpetuated through firmly established ways of production and consumption and a lack of adequate policies regarding human population increase" (Naess, 1989, p. 23). Chapman (2008 & 2015) adds that the environmental issues are proof of a lost emotional connection to the material world. Today, it is commonly recognized that humans are contributing to climate change through the unbearable production and consumption in the developed-world (Chapman, 2015; Fletcher, 2013; Naess, 1989).

When tracing back the causes of this unsustainable way of producing and consuming, it is easy to get stuck in discussing the effects of Industrial Revolution. The obvious factors regarding "changing concepts of person, production, and value spiraling out of control in the wake of the industrial revolution and beyond" have been much reviewed in literature (Kuchler, 2007, p. 127). The Industrial Revolution also marks the design history, as the time when the design profession was created, to meet the needs of the growing industries (Papanek, 1971). However, the excessive manufacturing and consumption lead to rising levels of pollution, and thus an increasing environmental concern, also among designers (Chapman, 2015, p. 8). Yet, according to Uekoetter (2010, p. 5) the Industrial Revolution "was not a causative factor in its own right but merely the product of a complex confluence of trends"; such as public pressure, laws and agencies and institutional settings, all directing human behavior.

Another ecological awakening is referred to have happened in 1966 when NASA delivered the first photos of earth. This "overview effect" made people want to take care of the planet and see it as a holistic ecosystem and living organism, worth protecting. Several new environmental laws were set in the early 70's, pushing designers and companies to change and accept new standards in their practices (Chapman, 2015, p. 2).

According to Papanek (1971) we need to look critically at the design profession itself, which functions at the heart of production. "By creating whole new species of permanent garbage to clutter up the landscape, and by choosing materials and processes that pollute the air we breathe, designers have become a dangerous breed. And the skills needed in these activities are carefully taught to young people" (Papanek, 1971, p. ix). Even though Papanek's book "Design for the real world" written in the 70's continues to be as timely as ever, much have happened within design in the past 50 years. Today there are countless of strategies aiming to design for sustainability, yet, we keep trying to solve this crisis by creating more objects, by using more environmentally friendly materials, rethinking packaging solutions and using

alternative energy sources (Chapman. 2015, p. 8-9). To a large extent, the focus is still off from the actual problem which is connected to behavior, values, choices and dreams of people (Chapman, 2015, p. 1). Therefore, when discussing sustainability we need to start the by considering the root cause and stop trying to solve the issues of materiality in the same way which created the problem in the first place.

2.1.2 Invisible spaces of material flow

Anusas and Ingold (2013, p. 58) argues that our material world is in "guise of objects", which has led us to a "vicious cycle of increasing environmental alienation". When speaking about material, we automatically think about objects. Literature dealing with materiality is mainly focusing on how to use it and the material itself is missing (Ingold, 2011, p. 20). Materiality is, however, more than objects and the cultivation of material – it is the textilic, material world we live in – our living environment, natural and manmade. But because the process, that goes into making an object has become to a large extent invisible to us, we fail to "follow the material traces and environmental consequences of their activity" (Anusas & Ingold, 2013, p. 58). Therefore it is difficult to understand where material is coming from, where it goes after our use and how it effects our environment.

Heidenreich (2009, p. 1146) describes the same phenomenon as a space between the societal and natural world, formed by "great technical systems". These systems include for example transportation, production and information, and they regulate "modern society's exchange with nature" (Heidenreich, 2009, p. 1146). Usually these technical systems are hidden from the eyes of most people. Water is transferred long distances from its actual source, through hidden networks of pipes. Sewers flush away any evidence of trash on the streets. Energy and information is supplied through cables. Food is transported to supermarkets along our infrastructures. In textile industry, the workers are hidden inside large factories, often located far away from the end user (Fletcher, 2013). These invisible structures are hidden inside our walls, in the ground and in the outskirts of cities.

Most of us only see small parts of these technical networks, in the form of buttons and taps, and experience only the benefit of the material such as cleanliness and warmth (Heidenreich, 2009). According to Heidenreich (2009) these infrastructures have been influencing how we perceive nature, since the 19th century. The technical structures are characterized by

continuity, giving people a false idea of a never-ending source. Despite recycling and utilizing by-products and waste, this false idea contributes to a "cultural perception which disconnects the consumption of natural resources from its natural context and its environmental impact" (Heidenreich, 2009, p. 1147). This blindness that depicts a cultural perception of modern exchange with nature, is one of the biggest challenges of sustainable development. A lot of effort has been made through information and education, to "open people's eyes". Yet, this kind of knowledge remains abstract when it is not connected to sensory perception (Heidenreich, 2009, p. 1153).

2.1.3 Making things visible

In the history we can find great examples of how companies and communities were eager to show newly built infrastructure, such as railway stations, water towers and power plants, to the public. Electrical systems and public transportation were proudly explained and exhibited. They were often built with impressive architecture, located in the heart of cities. Today, we are lacking this original excitement of our technical achievements and many of these monumental works are hidden or centralized in industrial areas outside cities. After years of hiding parts of the material flow, perhaps we could learn from the past and begin to systematically exhibit our technological structures again (Heidenreich, 2009, p. 1153-54).

According to Heidenreich (2009) it is important to give access to people and explain how the structures work, while taking responsibility on a local and regional level and exploring sustainable alternatives. Bringing water and energy supply closer to people will make them more perceivable. It should be a collaboration between professionals in politics, technology, history, art and design. Raising public awareness of sustainable development is "a matter a new cultural perception of the mainly technical interactions between society and nature. Only if environmental knowledge is completed with concrete experience and sensual perception it can turn over in environmental behavior" (Heidenreich, 2009, p. 1153-54). This is an enormous challenge, which can hardly be met due to for example globalization, as much of the material production is out of reach. However, it shows that there is an even higher need to represent these distant supply chains to explain them and materialize them.

Yet, today's technological structures are to a large extent related to digitalization. This is also invisible to the human eye and might therefore lead to an even greater loss in thinking in terms of material connection, which has "been the driving force of invention for centuries" (Küchler, 2008, p. 127). By recognizing these concerns, Küchler (2008) argues that the practical tool of material thinking has potential for binding together science and art by using creative forms in developing material. The idea of making something invisible visible is at the core of both art and design, constantly balancing between abstract and concrete, material and immaterial, body and mind. Lippard (1997, p. 262-275) is suggesting that artists should "look around at what is already in the world and transform it into art through the process of seeing, naming, and pointing out, rather than producing". Thus art and design are providing the appropriate tools to expose the hidden parts of material flows to create more awareness of the material environment.

Heidenreich (2009) and Manzini (2015) are suggesting several ways of how to make the invisible processes visible and raise a public awareness of sustainable development on a concrete level. Both are proposing mapping as concrete method for making things visible. However, Heidenreich sees mapping as the weakest method for visualizing material flows as it would only survey the framework, which is why other possibilities could be more effective (Heidenreich, 2009, p. 1153). Manzini is further proposing place making, which aims at connecting a space to the people that live there (Manzini 2015, p. 121). By adapting these methods into the context of making technical spaces visible, it could mean for example designing activities that allow people to explore the hidden networks, creating memories to add emotional meanings and understandings to the space. In this way design has the capability to connect people to their surrounding (Anusas & Ingold, 2013, p. 58).

To make the invisible spaces of material flow visible is an effort for sustainability, but also making sustainable activity itself visible is equally important. Therefore practicing "the ability to imagine future systems and giving space to alter or enrich perceptions can create new opportunities and revenue streams within sustainable futures. Most importantly, engaging with the smell, the sound, the touch of the future – imagining its human qualities and thereby bringing it to life – situates the sustainability imperative in the personal and real domain and thus gives it a proper place in our collective plans and actions" (Tham & Lundeby, 2008, p. 12). To be able to create a sustainable future, we need to be able to imagine it, to see the opportunities and the advantage points ourselves, to be able to take action.

2.2 Material culture

This chapter is including discussions about the human relationship to objects and waste, considering how the concepts are changing through ideas about a circular economy. It opens up the question of how artefacts and material could be part of a conversation and contribute to communicating and promoting sustainability to create new narratives about our material environment. Objects are part of our daily life, yet surprisingly little attention is given to how they affect us. Often it is considered that objects are just objects and proper research considers mind over matter. However, Knappett (2005) argues that humans are thinking through material culture, as behavior and knowledge is embedded in the everyday objects. Therefore he argues that it is important that they material objects are included and considered in research about how humans relate to their environment. Design and objects are attached with meanings and the knowledge is transferred through artefacts is several ways, which are to some extent intuitive or unconsciously affecting behaviour (Ewenstein & Whyte, 2007; Sarantou, 2014; Knappett, 2005).

2.2.1 The object and a changing relationship

As a designer it is natural to be interested in material, form and objects. Design is about "form giving" and therefore constantly about rethinking the form (Friedland & Yamauchi, 2011, p. 69). Anusas and Ingold (2013, p. 58) argues that our material world is in "guise of objects". When we imagine material, we tend to automatically think about objects. This obsession with physical objects has deep roots in our way of thinking, and dates back to the 17th and 18th century to fields of engineering, where there was no difference between artefacts and machines, and even to biology, which considered living organisms as "shapes with a purpose" (Troncon, 2011, p. 317). Today this fixation is evident in several ways. Living in a capitalist economy, people are often described as consumers, that from an environmental perspective are now drowning in objects and waste (Chapman, 2015). Capitalism is built on the idea that happiness comes from our fulfilled material desires and progress has for a long time been measured by the amount of energy consumption. This has led to a false idea of an unlimited source of material and thus an unlimited consumption and economic growth (Fromm, 2013, p. 1; Naess, 1989, p. 24).

Countless theories have been made trying to understand immaterial factors that affect the wasteful production and disposal of objects. There are theories that try to understand “the user psyche, such as personality differences, status and desire”, whereas other theories explore issues such as “spending, saving habits, general product preferences and fashion cycles” (Chapman 2015, p. 36). While these theories have led to an enormous development of sustainable practices, the root causes are still overlooked, with the only difference that virgin materials are sometimes exchanged into recycled materials, thus hardly making an impact if the consumption amount is continuing to grow.

However, a recent publication by Sitra is focusing on our changing relationship to objects, which is developing new wants and needs on the market. People want the objects to last for longer and connect with collective interests, which might take the ”shape of reflecting environmental values or choosing to consume products that create connections with others, such as local communities” (Korkman & Greene, 2017, p. 6). Additionally, by ”removing unnecessary clutter, consumers can create a space for calm personal development” (Korkman & Greene, 2017, p. 6). While this forecast seems rather positive, there is a concern that new products are being made to match the new consumption desires reflecting new values, which is further increasing production and consumption, and eventually creating more waste.

2.2.2 Waste matters

According to Desrochers (2007, p. 349-350) “the terms ‘waste material’ or ‘waste products’ were historically understood to encompass those materials which were produced as a result of the processing or manufacturing of a primary commodity, or were residues of finished products which were no longer fit for their original intended use“. Therefore, it might seem like an odd contradiction to claim that waste matters, as waste is commonly understood as something unwanted and left over. However, waste management has become increasingly important and it no longer covers merely waste disposal. Through new technologies waste is transformed into resource. This opens up new commercial possibilities for industries and authorities to ensure a safe disposal of waste, creating business opportunities in changing waste into something that is now wanted, reclaimed and valued (Weetman, 2016; Harvey 2014; McDonough & Braungart; 2013 & 2002).

As the ”industrial infrastructure is designed to chase economic growth” (McDonough & Braungart, 2002, p. 42) also waste management is now becoming increasingly competitive. Waste trade is a billion dollar industry, recycling industry is circulating waste around the planet chasing the highest profit, transforming matter into new forms (Moore, 2012). This confirms that waste does indeed have life after death. However, it is important to highlight that this movement is also driven by the toxic and hazardous qualities of waste, which is sometimes even life threatening. It is this toxicity that is being managed when we discuss waste management (Harvey, 2014, p. 62; Rushton, 2003), not purely the material aspects.

The process of waste management includes generation, collection, processing, transportation and disposal of waste. As waste can be anything discarded, it is a result of a complex mixture of substances, some of which are hazardous to our health and the environment. According to Rushton (2003, p. 184) the “three largest waste streams in this category are oils and oily wastes, construction and demolition waste and asbestos, and wastes from organic chemical processes”. In most developed countries the government is closely regulating waste management. The main methods for waste management includes recycling, composting, sewage treatment, incineration and landfill – all of which includes pro’s and con’s (Rushton, 2003).

- **Recycling** refers to reclaiming and recovering the usable material at the end of consumer use. Recycling can be divided into downcycling and upcycling. With a low demand for products, it is also possible to break down artefacts into its basic components, which can be reassembled. There are currently several new innovations making recycling more efficient. This method requires cooperation from individuals and businesses (McDonough & Braungart; 2013 & 2002; Rushton, 2003).

- **Composting** is a biological process where biodegradable organic matter is degraded into soil and biogas, which is utilized in for example agriculture and energy production. There is however a threat of organic dust containing bacteria, and when used within agriculture there is a risk of contaminating the food chain (Rushton, 2003).

- **Sewage treatment** is a process of removing contaminants from raw sewage and municipal wastewater. It is a safe disposal of human waste and it produces non-toxic water, which is run into rivers or the sea, and a "semi-solid sludge, which is used as a soil amendment on land, incinerated or disposed of in land fill" (Rushton, 2003).

- **Incineration** is "a process of combustion designed to recover energy and reduce the volume of waste going to disposal" (Rushton, 2003, p. 68). Non-recyclable waste is often incinerated, yet, the processes can vary significantly and due to lacking methods for sorting waste, therefore also recyclable material is being burnt at some energy plants, leading to a certain loss in the material value. Combustion of waste emits large amounts of hazardous pollutants and heavy metals. It is also argued that combustion of waste is slowing down the development of proper recycling systems. Nevertheless, the modern waste-to-energy plants are significantly more developed compared to early WtE-plants and allows controlled separation and treatment of toxic gases. Combustion of waste protects water supply and reduces significantly the volume of waste, while producing energy, thus contributing significantly to keeping our environment clean.

- **Landfills** are used to "the deposition of waste in a specially designated area, which in modern sites consists of a pre-constructed 'cell' lined with an impermeable layer (man-made or natural) and with controls to minimize emissions" (Rushton, 2003, p. 68). We use landfills for organic material and sadly also other types of non-degradable material end up in the ground. This is a cheap disposal method but has several risks of polluting the soil and water, while spreading diseases.

2.2.3 Closing the loop

From the material perspective an economy in which material is being taken, extracted, made into products and eventually discarded, is called a linear economy, as it creates a linear material flow. McDonough & Braungart (2002, p. 93-102) are describing this flow of material as a "cradle to grave" model. Textile and fashion industry is a good example of a linear material flow as clothing often has a short life span, polluting and complicated processes and long supply chains. Due to the mixture of different fibers it is difficult to recycle textile properly (Weetman, 2016; Chapman, 2015; Flether, 2013; MacArthur, 2013) Clothing might be recycled through second hand shops or the fabric might be sewn together into new products.

However, these actions are considered downcycling, where the material life cycle is extended. Upcycling, on the other hand, means to regenerate the material into a product of the same or higher value (McDonough & Braungart, 2013 & 2002).

At a concrete material level, upcycling is considered part of a circular economy, which "is far more ambitious than increased recycling" (Weetman, 2016, p. 3). The main goal of a circular economy is to keep the material in circulation, through creating loops. The modern term of loop closing "refers to the linkages between different industries in which the residual of one becomes the input of another" (Desrochers, 2007, p. 348-349). All material should either be part of a technical cycle or a biological cycle, where it is designed to be fed back into the material flow to become raw-material for yet another cycle, forming a continuity. Biological material is designed to be returned to nature (Weetman, 2016; Harvey 2014; MacArthur, 2013; McDonough & Braungart; 2013 & 2002). As a design approach this kind of philosophy is called "Cradle to cradle" (McDonough & Braungart, 2002, p. 103-105). This idea is by no means anything new as utilizing by-product have always a quality of the market system (Desrochers, 2007). Yet, new technological development is opening up new possibilities to develop material use.

A circular economy is including a wide range of approaches, and it has never been as organized and systematic as it is today. Through extending the value from product use to end of life, it covers the entire supply chain until manufacturing, distribution and sales. It might be about redesigning a product, using alternative materials, recovering value from what was previously perceived as waste. In a circular economy one of the goals is to design waste out and look for alternatives to substitute toxic materials (Weetman, 2016; Harvey 2014; MacArthur, 2013; McDonough & Braungart; 2013 & 2002). On an immaterial level the circular economy is also challenging the seemingly static philosophy of 'purchasing-owning' with for example 'leasing-using' pricing policy, rethinking the concept of owning and discarding. A circular economy might therefore be about selling a service instead of a product (Weetman, 2016; McDonough & Braungart, 2002). "This requires radical rethinking for supply chains, creating collaborative, symbiotic networks that may connect within and across industry sectors" (Weetman, 2016, p. 3). It will also place new requirements of transparency to open up opportunities for new partnerships, collaborations and communities which are made possible through a wide access to internet connection (Weetman, 2016; Thackara, 2015; MacArthur, 2013; Manzini, 2009; McDonough & Braungart, 2002).

Manzini (2009, p. 48-50) categorizes three directions, which further expands our thinking from services into networks. Firstly, he recognizes that one of these future directions is "distributed systems" where for example manufacturing and energy systems are decentralized and spread into interconnected networks. Secondly, he describes a "collaborative network" which allows a large number of people to contribute with their knowledge. Wikipedia is a good example of this kind of network. Thirdly, he identifies that "creative communities" are inventing new ways for living sustainably through reinventing for example housing, transportation and food production. These new kind of communities are all part of a circular economy, which aims to create a new economy based on increased sharing and collaboration, creating new meanings and value systems for the future.

2.2.4 The artefact is a narrative system

From rethinking the economy, back to the material level, the focus is shifted to the concept of meaning, which is "perhaps the most complex of all" (Chapman, 2008, p. 37). I am interested in how material can be appreciated and what are the objects around us communicating, thus considering if value and meaning can be designed.

Design is embedded with meanings and the knowledge is transferred through artefacts is several ways (Caccavale & Shakespare, 2014; Sarantou, 2014; Chapman, 2008; Ewenstein & Whyte, 2007; Knappett, 2005). However, these meanings are often overlooked, as they are to some extent intuitive and also unconsciously affecting our behaviour. Nevertheless, it is part of the human value system to embed meanings into artefacts. Knappett suggests that rather than separating the material and immaterial, we should considering that "mind and matter achieve codependency through the medium of bodily action" (Knappett, 2005, p. 169). This complex codependency between mind, matter and action is proposing that objects are essential for human understanding and perception, effecting ideas and attitudes.

Some meanings attached to objects are imposed upon us by the dominant narrative, which is formed through the stories that we are told about for example history and politics, affecting our believes and values. For example there is an established belief and retold story, that technology will solve global problems (Sarantou, 2014, p. 21). Meanings are also articulated through symbolic representations (Akimenko, Miettinen, Sarantou, 2016; Sarantou, 2014; Ewenstein & Whyte, 2007, Knappett, 2005) These unique meanings are determined both

temporally and spatially. Also the influences by the 'viewers' previous experiences are effecting how the object is being interpreted. An object might mean different things, during different times and in different places. By changing the place of an object, also its meaning is changed. Thus, time and place should be reflected on in order to understand the "narrative potential" of artefacts (Sarantou, 2014; Chapman, 2008).

Because of these shifting variables it is difficult to control the meaning of an object. For example, in a global market, the local meanings are lost because of continuous movement of things. Therefore, there is no way how a maker of an artefact can fully control the meanings that it will bring to people. According to Hall (1997) meanings are created through two systems of representation. Firstly through the mental representations and secondly through the language we use. Thus, meanings can only be roughly directed by designers (Sarantou, 2014; Chapman, 2008). Yet, it is this particular nature of meaning that according to Chapman (2008) opens up the possibility for designers to create unique experiences, which are characterized by the individual human emotion, expectations and memories.

This approach might offer an opportunity to communicate about sustainability through artefacts. Artifacts can be viewed as knowledge that is manifested in material form and through interacting with them they can "generate knowledge individually or collectively" (Ewenstein & Whyte, 2007, p. 5). By designing positive experiences of sustainability (Tham & Lundeby, 2008), it is possible to create individual meanings that will bring a deeper understanding of sustainable futures. Design can be looking at relationships between immaterial an material qualities, considering that products and services can embody ideas, point of views, meanings, discussions and values (Caccavale & Shakespare, 2014, p. 25).

2.3 Critical design

This chapter is discussing the value of critical design through briefly reviewing its history, discussing the main methods, potential and the most common critique. The focus is on recognizing how critical design could be used for understanding the material flow and identifying value opportunities, while discovering the potential of critical design within design education, service design and design thinking.

Despite the fact that we are constantly effected by design and the objects around us, only a small discourse has been concentrating on "the effects of design from within the design profession" (Malpass, 2017, p. 7). This is where critical design fits in. Critical design is described to be intentionally or systematically questioning the very system which it is produced for, functioning as the opposite of affirmative design, which is following the status quo (Dunne & Raby, 2013). Anthony Dunne and Fiona Raby, who popularized the term in the 90's (Malpass, 2017), are describing that "on the most basic level it is about questioning design itself, on the next level it is directed at the technology industry and market-driven limitations, and beyond that, general social theory, politics and ideology" (Dunne & Raby, 2013, p. 34-35). The main attitude of critical design is that critique is needed, it creates a space for discussion, believing in development and a possible change in values and practices. Critical designs offers alternatives to what we consider normal, and strives to point out weaknesses in the systems we are used to by reimagining possible futures (Malpass, 2017; Jakobsone, 2017; Dunne & Raby, 2013).

2.3.1 Brief history of Critical design

Criticality within design is by no means anything new. It has its roots in product, industrial and interaction design. According to Malpass (2017) conceptual and critical forms of industrial design first emerged in the 50's artistic avant garde design practices in Italy. That was the time when designers started to show signs of being dissatisfied with merely serving monetary goals such as production and consumption. Instead they started to set political goals, critiquing the capitalist consumerist society. Designers started to incorporate intellectual value to everyday products and the attention shifted from functionality to seeking materials that could be used to making comments. The results were familiar products that were encouraging the user to for example rethink the use of the product. This period was marked by radical and anti-design and the work was usually exhibited in galleries and through publications (Malpass, 2017, p. 17-19).

Meanwhile, another form of critical practice was emerging in Scandinavia in the 70's, known as participatory design (Malpass, 2017, p. 25), shifting the focus to processes instead of style. The principle of participatory design is to involve stakeholders, such as employees, users and citizens, in the design process. This approach is equally critical, taking a political view, democratizing the design process by looking at the relationship between for example the

designer and the end user. A participatory design process will highlight the tacit knowledge of the participants, with the philosophy that everyone encompasses valuable knowledge (Malpass, 2017; Sanders & Stappers, 2008;; Papanek, 1971). This knowledge is expressed through interaction with objects and people (Malpass, 2017; Miettinen & Koivisto, 2009).

The term "critical design" was first used in the 90's academic design research community, as a specific approach within human-computer interaction design. Yet, it was part of the same tradition of criticality, which started within product design. Through constructing new narratives, the aim was to form alternative directions of product design, that had been overlooking human values (Malpass, 2017, p. 38). This criticality is evident in modern human centered design, design thinking and service design practices. History has taught us several methods of how to build critical thought into design processes, objects and services. Though criticality is today incorporated in many design approaches and it is used loosely to mean any design action with a critical agenda, critical design is also a discourse of its own. A contemporary critical design practice has reemerged as a discussion in design research, exhibitions and publications (Malpass, 2017; Dunne & Raby, 2013).

Through its history, critical approaches within design have been rising out of turbulent social, economic and technological settings. It has been supported usually by established communities and backed up by academic institutions. Paradoxically, it is still supported by and dependent on design culture, media, publications and established institutions, the same culture which it is critiquing (Malpass, 2017, p. 38).

2.3.2 Critical design in Practice

According Dunne and Raby (2013, p. 35) critical design is "about thinking through design rather than through words and using the language and structure of design to engage people". It tries to question, rather than provide answers. The goal is to create reflection on the discourse from within (Malpass, 2017). Dunne and Raby (2013, p. 35) are claiming that "all good design is critical" and designers are used to questioning and identifying weaknesses and suggesting better versions. Thus, critical thought is not explicit only in critical design. However, critical design is materializing critical thinking and targeting this criticality into complex large scale problems (Malpass, 2017; Dunne & Raby, 2013).

As a medium of enquiry, critical design strives towards diversity instead of simplicity. The result might be an object which aims to materialize and communicate issues. Designed objects are used as a way to engage people to think critically about the presented subjects and themes. Mattelmäki (2006) is calling these objects probes and they are used in the design process to collect information through engagement with an object. The interactions and discussions that occur around the object will bring a deeper understanding of an issue and produce new insights and knowledge. The approach is grounded in participatory design and it is based on the idea that interaction and debate can help us to understand and explore relationships (Malpass, 2017; Bowen, 2007). Bowen (2007) claims that critical design objects have proven useful incorporated in the design process, and presented to stakeholders. Here the critique is not necessarily transferred into the end product, but serves as method within the design process. However, he recognizes that more research is needed for developing it into a generalisable method, as this approach is relying on the idea that people understand the world through material forms, which might not be applicable to everyone (Malpass, 2017, p. 43).

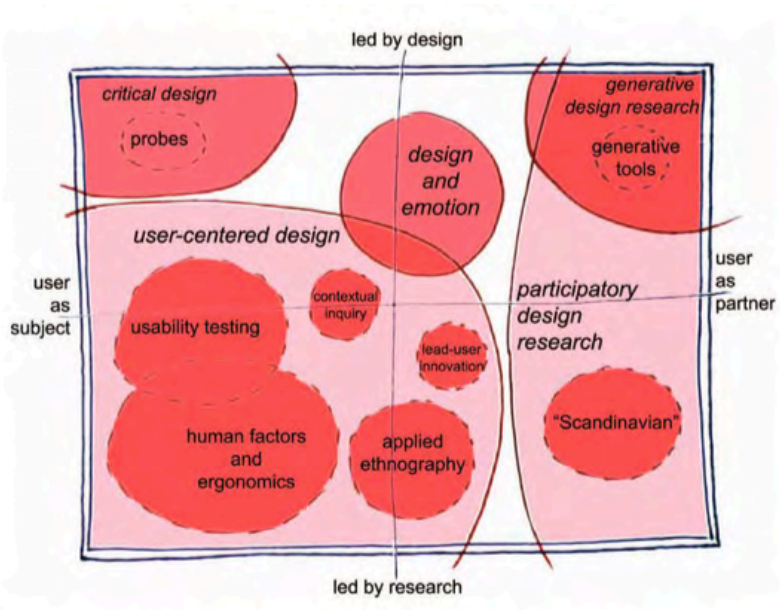

Figure 1 The landscape of human-centered design research. (Sanders & Stappers, 2008, p. 6)

The figure by Sanders and Stappers (2008, p. 6) is showing where critical design is positioned in the field of human-centered design. It is describing that critical design is "led by design" and places the "user as subject" not as an equal partner. Often critical objects are created without the input of users and the interaction is created through presenting a ready-made

object to the audience. However, there are examples where the audience is participating in the critical design process, giving a physical form to the process. Nevertheless, this interaction could be seen as a method and part of a larger design process dealing with complex issues.

As an investigative medium, critical design is used to draw attention to things that are normally unseen in our everyday life. For example the work Faraday Chair by Anthony Dunne and Fiona Raby made in 1997 is a furniture that offers protection from electromagnetic fields (Malpass, 2017, p. 44-45). It is designed to point out an invisible issue, asking questions about impacts of electronic radiation. This approach is aiming to affect emotions through aesthetic experiences, not to offer a practical solution nor an explanation. It aims to disturb and provoke discussions (Malpass, 2017). Another approach is to suggest problems through leaving them "un-critiqued" (Bowen, 2007, p. 1) and pointing out the weaknesses through this. Good critical design is however not only pointing out flaws, it is also suggesting on how things could be better (Dunne & Raby, 2013).

Critical design has exploratory potential and it is getting attention in the intersection between science, technology and design. In for example new material development, critical design is "used to question the potential applications and implications of scientific and technological theories and research being carried out today and how these developments might manifest in the future" (Malpass, 2017, p. 51). Critical design is often driven by a sceptical fascination to technological development (Dunne & Raby, 2013) and therefore the debate is also situated in the intersection of these areas.

Another way to use critical design might be through creating narratives, presented as photos or film, telling a fictional story about how an object could be used. By placing the object in the context of everyday life it will encourage the user to interpret it (Malpass, 2017). Through design fiction, prototyping and storytelling are used as methods to reflect on new ideas. The created objects might function like "props or conversation pieces that help users imagine" (Malpass, 2017, p. 54). This is a way to materialize ideas and encourage to see what could be. Speculative design is also concerned with the future and uses methods of storytelling to create visions of the future. These methods have potential to give people an experience of sustainability – how it might feel, taste and sound like (Tham & Lundebye, 2008).

2.3.3 Potential of Critical design

Jakobsone (2017) identifies that critical design could be of substantial benefit for design thinking. Design thinking is a methodology which could be adapted into any field and it embraces a human-centered design approach. This means "that innovation is powered by a thorough understanding, through direct observation, of what people want and need in their lives and what they like or dislike about the way particular products are made" (Brown, 2008, p. 1). According to Jakobsone (2017), critical design could contribute to design thinking especially in two areas. Firstly, through its focus on the future, specifically through methods of speculative design, creating future scenarios and pointing out probable, plausible, possible and preferable futures, making the future more perceivable. Secondly, through the ideological awareness it brings. "Design literally forms our material environment, it gives physical shape to every artificial object we use or encounter, and thereby it has effect on our thought, actions, and habits. It is ubiquitous, it forms the idea of norm, and therefore it is a perfect medium for ideological propaganda" (Jakobsone, 2017, p. 260). To be able to make informed decisions, it is relevant for every designer to have an understanding of ideology and this ability could be practiced through critical design projects (Jakobsone, 2017; Tham & Lundebye, 2008).

Yet, according to Jakobsone (2017, p. 253) "there is no reliable data that would allow us to make claims about the efficiency of critical design in terms of its potential of influencing a broader audience, but we do know that designers themselves have acknowledged that this approach has affected their own evolution as professionals". Therefore, it makes sense to highlight critical design as an activity that can significantly transform the way designers act. This enlightening ability is what makes Jakobsone (2017) suggest critical design as an integrated part of design education. Yet, Jakobsone (2017, p. 258) claims that critical design should not be restricted to "non-commercial or self-initiated design projects" and it should be applied into real life situations, also outside the academia. Holmid (2009, p. 89) also recognizes the potential of critical design arguing that service design can learn from the critical design school. Firstly, he highlights that the critical design techniques, which are directing the designer's attention "to understanding context and activities" can also be used as "techniques for defining the meaningful contexts and actions that work as motivations for a specific channel". Secondly, he claims that there is a need to develop research about how a process can be used as a critical object, where the process itself could be considered to have a form and produce the same questions as an object would.

2.3.4 Critique of Critical design

Approaches of critical design are increasing in popularity, together with a growing amount of critique. Malpass (2015, p. 59) claims that critique of critical design is often grounded in two arguments. Firstly, critical design is often viewed as art, where such form of critique has a long history. Critical design is considered to be difficult to place neither as art nor design. Secondly, it is argued that critical design is lacking function. According to Jakobsone (2017, p. 255) the common "reaction on critical design is probably the claim that it is an egocentric and useless practice, carried out for its own sake; a waste of time, effort and money for making things that do not solve any problems or do not have any function". Yet it is evident that these statements are clearly missing the point of critical design.

As critical design has a history of being exhibited and displayed in galleries, much like art, it is understandable that there is misconception of how to understand and view it. Critical design is also making commentary, much in the same way as we recognize in art. It is also borrowing methods and approaches from art. However, this kind of analysis of critical design practice is usually coming from the discourse of art and visual culture. Analysing the practice from the perspective of aesthetics has its restrictions. To be able to understand the practice we should, instead, consider viewing critical design from a design aspect, which will lead to different kind of questions. Critical design is much closer to everyday life and that is also where it has potential to make a difference, by proposing that what we consider familiar, has potential to be something else (Malpass, 2015 & 2017; Dunne & Raby, 2013).

Critical design is also repeatedly claimed to lack purpose (Jakobsone, 2017; Malpass, 2015). It does indeed stand outside what we consider everyday products of use. Critical designs are not made to be industrially produced and usually they stay as odd, non-functioning prototypes. Nevertheless, lacking function in a practical sense does not mean that it lacks function entirely. The argument is grounded in the simplified idea that design is about problem solving (Jakobsone, 2017) and to understand critical design, design must be understood in its largest sense. Function must be looked at beyond products of everyday use. The focus is on symbolical, cultural, existential and discursive design work and it requires intellectual effort to understand it. The role of the designer is extended "beyond being an agent of capitalism" (Malpass, 2015, p. 60) to use the design skills and training for stimulating debate. It is about facilitating "a way of knowing, exploring, projecting, and understanding the relationship between users, objects, and the systems that they exist in" and about interacting and

understanding issues more directly, through debate and material objects (Malpass, 2017, p. 43). Yet, critical design is continuously being misunderstood by the audience and therefore hardly reaching its full potential. Thus more awareness is needed and to point out that critical design can be understood by a larger audience, it could be considered to highlight a larger degree of inclusion. This could give the approach more space also outside the academia and outside the design world.

2.4 Conclusion

The literature review is including discussions about materiality and material culture from a design aspect, pointing out a connection between the relationship with objects and a relationship with the environment. It is containing a brief review of key concepts such as material experience, circular economy, waste management and critical design. By looking at the relationship to material, the study identified invisible spaces of material flow, created within for example production, infrastructure and transportation and experienced as a lack of perception in for example where material is coming from and where does goes after our use. These form gaps in our understanding of material flows, making it difficult to follow the environmental consequences. This blindness that depicts a cultural perception of modern exchange with nature, is one of the biggest challenges of sustainable development. A lot of effort has been made through information and education. Yet, this kind of knowledge remains abstract when it is not connected to sensory perception (Heidenreich, 2009). Environmental behavior can be created only when environmental knowledge is connected to real life experience and sensory perception. Therefore, making the material flow more transparent and rebuilding a relationship to the material environment should be considered on management and strategic level.

Through investigating broken systems and environmental alienation the literature review showed ways of how to overcome the overwhelming issues of unsustainability and how to move forward as a designer. Design can contribute to visualizing, materializing and concretizing the invisible gaps of material flows, hence making them more concrete and understandable. Critical design offer tools for questioning and reveling hidden meanings and values which might otherwise remain unseen, because of oversimplification (Singer, 2017). It is trying to create diversity in thought and in action, rather than serving mainstream ideas about design as a tool serving production of things.

Due to the broad research area, the literature review is holding several gaps such as a deeper review of waste management practices and a political discussion about waste trade, focusing on waste-to-energy plants and how they relate to a circular economy. The attention is to a large extent set on the role of perception and touch when it comes to understanding the material flows. Yet, there are other ways of how to create a material understanding and a relationship to the environment, such as through movement in nature. These alternative ways could be discussed through further research. The following chapter is concentrating on the methodology of the study, demonstrating how the research was conducted and what are the reasonings behind the choices of methods.

3 Methodology

This thesis a qualitative small-scale study placed within design research, drawing on the ethics of reflexive research and practice-based approaches. The data is collected through methods such as observation and workshop, documented in the form of photography, video and field notes. The data is analysed by categorizing and organizing them in themes, supported by literature on qualitative content analysis. In this chapter I will discuss the reasoning behind my choices concerning philosophy, research approaches, methods of inquiry, methods of data analysis and research ethics.

Figure 2 *Methodology*

3.1 Philosophy and material thinking

This chapter opens up how I, as a researcher made my decisions and arrived at certain value assumptions - how do I perceive social reality (ontology) and what do I consider as acceptable knowledge (epistemology). My thinking is influenced by ideas of constructivism and interpretivism. These assumptions and beliefs, form together my understanding of identity and creates my worldview (Leavy, 2017; Mackenzie & Knipe, 2006).

Constructivism pays attention to the subjective nature of meaning making. Reality is an ongoing transformation and a process of construction and reconstruction, where social actors have a crucial role in creating the social reality. It means that culture is created through interaction and anyone can affect reality and the future. Knowledge comes from real life experiences, formed by society (Leavy, 2017; Mackenzie & Knipe, 2006; Schwandt, 1994).

Interpretivism, on the other hand, makes sense of the world from the individuals point of view. In order to understand the world we need to interpret the meanings of it (Schwandt, 1994). Social reality cannot be studied in the same way as nature, because people have to cope with complex social, environmental, political and economic realities. Therefore a researcher needs to add empathy and understanding when interpreting. Knowledge is constructed of multiple methods (Leavy, 2017; Mackenzie & Knipe, 2006; Schwandt, 1994). Constructivist and interpretivist values are grounded in the same heritage "concerned with matters of knowing and being", asking questions about the aim and purpose of how humans create knowledge and how people can learn about the world through action (Schwandt, 1994, p. 222).

I consider that these ideas, drawing on interpretative and constructivist values, function as an overarching philosophy through the thesis and I think it naturally connects to the field of design. Several researchers are arguing that there is a specific kind of knowledge in the material, in the experience and in the making. Cross (2001) describes this as a "designerly way of knowing", arguing that there is knowledge in the design process which is different to knowledge generated through other scientific methods. He states that design knowledge has "three sources: people, processes and products" (Cross, 1999, p. 5). Others have named this "experiential knowledge" or "material thinking" (Nimkulrat, 2012, p. 1). Research though creative practice is considered a natural working method for artists and designers to explore their topic. However, this kind of research that is a part of a creative process is not equal to academic research and these two should not be mixed. Nevertheless, it is possible to include

it in academic research, when it is reflected on through articulation. A created object can therefore not be considered outcome of a research, but rather work as a "vehicle" for the research (Nimkulrat, 2013, p. 1-16). According to Nimkulrat (2012, p. 1) a practice-based approach can "facilitate the reflection and articulation of knowledge generated from within the researcher-practicioner's artistic experience, so that knowledge becomes explicit as a written text or as a means of a visual representation". This means that the value of the research is in the written and visual interpretation.

Continuing on my personal project to research sustainability, the thesis is initially a way to channel my questioning through practice, sensing and reflecting into a concrete project, which eventually feeds right back to the thought process. It is about challenging my own and others thinking through a design process and listening to what the objects around us are saying, revealing hidden meanings and values. This can be considered as a way to explore opportunities of how to communicate and educate about sustainability (Tham, 2014). The process is anything but linear. The topics, questions and methods are unfolded and defined along the research process (Mackenzie & Knipe, 2006).

I think that it is important to see, touch and feel to understand. Knowing on an intellectual level is not enough, we need an emotional and a tactile understanding too. Having a constructivist world view, which builds on the idea that we construct our own reality, I think that we can make changes in how we see the world by learning through new experiences. This world-view is essentially looking at the future with optimism, believing that change and development is possible.

3.2 Design research and reflexive research as research approaches

This qualitative research is following the principles of design research, which is characterized by its practice-based nature. According to Kananen (2013), design research is very close to action research, which has a long history in social sciences. The main idea of action research is not only to collect a better understanding of a problem, but it also aspires to alter things (Denscombe, 2014; McNiff, J., Lomax, P. & Whitehead, J., 2003). Action research is considered a self-reflective enquiry and pays attention to the researcher's subjective experiences. It is aiming to develop a deeper understanding about what the researcher is doing as an insider, rather than looking at external situations. The aims of the research are therefore

both personal and social – to improve the researchers own learning, and improve the social situation (McNiff, J., Lomax, P. & Whitehead, J., 2003, p. 13). Kananen (2013) is describing design research as "applied action research". The common nominator of these approaches is that they strive towards development and change, through practice. Despite the similarities, I have chosen to follow the literature of design research to support my methodology, as it provides with the suitable terminology considering the topic of my research.

Classical research is focused on pointing out single aspects and discussing them in detail, design practice however is often concerned with balancing several issues (Koskinen & Krogh, 2015; Cross, 1999). According to Koskinen and Krogh (2015) design research needs to consider many different factors and audiences. To tackle this issue within research, they suggest the notion of "design accountability". Design borrows from many fields such as science, technology and art. Thus, design accountability is proposing that design should be judged from a design aspect. Design research is concerned with producing knowledge that is useful to other design practitioners (Koskinen & Krogh, 2015) and therefore it should be looked at from the right perspective. Design research could be divided into three standpoints: research for design, research into design and research through design (Simonsen, Bærenholdt, Büscher & Scheuer, 2010). In this study I am focusing on research through design, where design is functioning both as a vehicle of the research and in constructing the process of the research (Simonsen, Bærenholdt, Büscher & Scheuer, 2010, p. 4).

Furthermore, I chose reflexive research as a complementary approach in my study. The possibility of reflexive research is to examine an insiders learning process, which is also the challenge of the approach, thus exploring how a researcher can document the subjective experience. The data is influenced by the researchers own feelings and therefore they should be discussed. The main idea is that these feelings serve as important 'research tools' for discovering possibilities. Reflexivity can also contribute to research process transparency and help to validate the results (Herland, 2017). The thesis is essentially exploring the role of a waste-to-energy (WtE) plant in the waste management system. However, it quickly became obvious that the task is too large for a thesis and one person. Therefore, I found it meaningful to explore my own relationship to the waste to energy plant and question where do I stand as a researcher, designer, maker and human in relation to the WtE -plant. Additionally, I consider that this kind of reflexivity is built into critical design, and therefore it offered suitable literature for my study.

Critical design became familiar to me in my previous studies and it was natural to continue with the same approach, while gaining a deeper theoretical knowledge through the thesis process. Critical design was used as an approach to collect insight into the subject on a personal and self-reflective level. Through the process, I was thinking critically, examining and questioning roles and relationships, methods, material choices, value systems, reasons and driving forces while simultaneously doing literature research and creating a framework for a workshop and making concrete objects. A critical design process allowed me to imagine questions, possibilities, opportunities and dream of how the reality could be. I explore critical and speculative design as method of revealing hidden meanings, adding to the discussion on how art and design can be used to communicate transparency and sustainability. The created objects strive to communicate the insights and question conventions to generate further discussions, identify aspects which should be considered in future development projects and materialize the concern of how to work sustainably as a designer.

3.3 Practice-based research, workshop and observation as methods of inquiry

I used practice-based research as the main method of inquiry. Kananen (2013, p. 12) is describing the practice-based approach as a "bridge between theory and empiria to understand a phenomenon or to solve a problem". In this method it is important to point out that the practice is not research as such, but rather a questioning process which is designed to collect data and to produce reflection about the practice (Nimkulrat, 2013). Nevertheless, it is possible to develop a theory derived from practice-based research, through articulation (Mäkelä & Nimkulrat, 2011). This is why it is important to add the written analysis of the creative practice. An artefact cannot be considered as outcome of research. It functions as a vehicle to deepen the understanding of a phenomenon. Material experience and tacit knowledge is an essential part of practice-based research in the field of art and design (Nimkulrat 2011). This means that my own experiences are a source of data inquiry. To articulate my experience of the creative process I use photo together with written descriptions of the process. This data is later analyzed and evaluated in a research context, which eventually will lead to the outcome of the research.

Because the topic required among other things an aesthetic understanding of the place and location, observation proved to be a useful method of inquiry. It is a diverse method that can be applied in several ways. Observations are made continuously in our everyday life. Direct

observation is done in the natural location observing a phenomenon so that all actors can see the observer. In covert observation the observer is hidden. I was however primarily using participatory observation (Kananen, 2013, p. 105) and actively participating in the research situation. To memorize and gather the information I photographed the energy plants practices and the space. According to Kananen (2013, p. 103) observation is also a good way to discover "silent information" that might not be reached in any other way.

I chose workshop as an approach to inquire data to help me to understand other's actions, attitudes and ideas. Workshops, facilitated by a tutor, is a method for inquiry that has been an established approach in the participatory design. It is often used in for example designing public space as it gives a sense of ownership to the participants. It is a method that can be used for "context mapping", to reveal needs, experiences, hopes and expectations and reveal subconscious meanings through metaphors (Miettinen & Koivisto, 2009). Interestingly, the workshop lead to a deeper understanding of my own practices and attitudes, which were developed during the interaction with other people. I learn through imagining myself in the position of the participants. It also created a context in which I could examine the surrounding. Together with reflexive and critical design thinking it added interesting questions into the process. It included practical considerations such as who should be involved, where should the conversation happen and whose responsibility it is to create the discussion. The process led to considering ethical constrains and opportunities of a waste-to-energy plant in taking part in education of sustainability, through communicating about their own practices, which raised questions about motivation and impact.

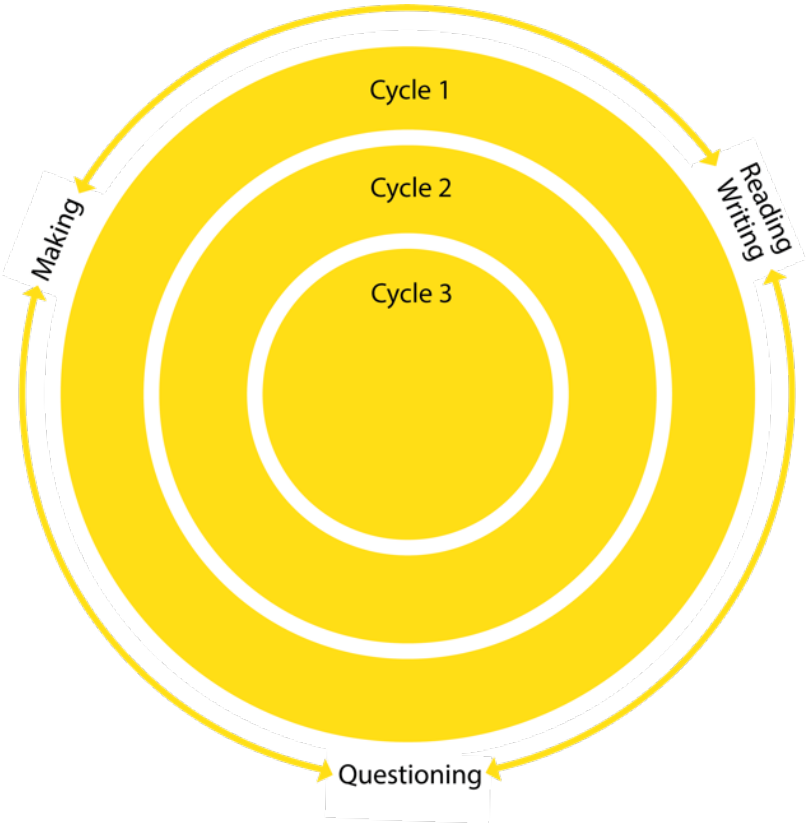

Figure 3 Process description and interaction between methods (adapted from Nimkulrat, 2012)

The data collection was constructed as a process of 3 cycles, each building on each other. I see my research strategy as cyclical, but not repetitive. I would describe it as a process resembling an onion (Kananen, 2013), where the layers were narrowing down the focus of the study. The first cycle was intended to map and investigate the context, through designing and facilitating a workshop. The second cycle was building on the previous one and consisted of a photo series, documenting and interpreting the objects that had been produced collaboratively. The third cycle is a reflection on both previous cycles, creating a textile installation, which was exhibited in the university gallery. Each cycle is a process of reading, writing, questioning, making and reflecting. Rather than expanding knowledge, it is aiming to focus and come closer to a core context. "Reading and making mutually supported each other. While literature brought ideas to be experimented in creative practice, creative productions suggested relevant literature to be discussed in relation to the productions" (Nimkulrat, 2012, p. 4). In this way, each action triggered a set of questions which lead to discovering themes and topics. Through reading I got ideas on how to develop further actions. These three cycles of data inquiry are discussed in chapter 4.

3.4 Qualitative content analysis as method for data analysis

Qualitative content analysis is a method where the acquired data is organized and grouped according to themes. Patterns are recognized and described, and finally summarized. The categories can be considered research findings. Each finding and category is linked to the collected data and discussed literature, as a supporting evidence. Themes are identified through the topics that have been discovered during the research process (Denscombe, 2014; Kananen, 2013). Content analysis can be used for producing themes, topics and point out connections. It does not produce exact data. However, it can produce interpretations and describe meanings that are created into stories in our minds.

According to Hall (1997, p. 1) "representation connects meaning and language to culture". Meanings are created through two systems of representation. Firstly, through the mental representations we have and secondly through the language we use. Constructivist view of the matter is that meaning is constructed through and within language, which means that the value of the produced data is in its interpretation, in describing it and putting meaning to it. Representations functions as the link between language and the concepts in our minds. They enable "us to refer to either the 'real' world of objects, people or events, or indeed to imaginary worlds of fictional objects, people and events" (Hall, 1997, p. 3). I used visual representations for constructing meaning to a an overwhelmed feeling caused by the unsustainable production of things. I created objects to materialize concepts that were abstract in my mind. Some concepts were expressed through symbols and signs hidden in the objects, and others were expressed through articulation (Akimenko, Miettinen, Sarantou, 2016; Ewenstein & Whyte, 2007, Knappett, 2005; Hall, 1997).

I have chosen to manage the mainly visual data virtually by naming, describing and arranging them into separate folders. I recognized the possibility to compare my photos and produced objects, to the photos and objects that were produced by the workshop participants. The analysis is validated through this separation of the data, together with the relevant literature review. Through this I recognized themes and patterns that I organized in categories. These categories are described and analysed in Chapter 5.

3.5 Ethics

In my study, the values and decisions were validated through an ongoing feedback from participants, critical friends and supervisors, both insiders and outsiders to the situation. My actions are, however, based on my own justified value systems and I recognize this as a massive responsibility. I aim to be as open as possible in my research about my reasoning, decisions and methods, both in referencing and in own expression. I validate my reasoning through referring to published research. Citation is following the guidelines of University of Lapland and APA-style citation. The structure of the thesis is drawing on advices by Marshall and Rossman (1999).

Further ethical considerations took place concerning regarding the collaboration with Westenergy and the workshop. When including others in the research it naturally raises questions about for example privacy, respect and democracy. The choice to create a workshop was an outcome of the thought of democratizing the space by including representatives of the biggest visitor group, which proved to be elementary school students. The under aged workshop participants were involved through an invitation, which was sent to over 200 elementary schools in Westenergy's operation area, to give as many as possible a fair chance to join and include the aspect of voluntary participation. A copy of the invitation is found in the appendices. In the appendices, you will also find a blank copy of the letter of permission, which was handed out to and signed by the elementary school students' supervisors. The letter is asking for the students' permission to join the workshop and display their work, and permission to be photographed, filmed and recorded. All students signed the letter and gave permission to exhibit photos and work produced by them and appear recognizably in the documentation. Participation in the workshop was on voluntary basis and the students were allowed to leave or withdraw at any time. Additionally, the students were always working in familiar groups and guided by their own teacher, representatives at Westenergy and me, as the workshop facilitator.

4 Waste to value -project

Waste to value -project started as a collaboration between Westenergy and the University of Lapland. The initial aim of the project was to develop, during spring 2017, the visitor experience for Westenergy. The projects goals were to give more value to the visitors and create discussions on several different levels; within the company, among the visitors and through the media (Corin, 2018).

Westenergy is a modern Waste-to-energy (WtE) plant located in the municipality of Mustasaari in Western Finland and it is an important part of the regions waste management system, utilizing source separated, non-recyclable and combustible waste into energy. Electricity and district heating is produced in cooperation with Vaasan Sähkö Oy, through using the steam produced in the plant. Westenergy's WtE -plant has been operating since 2012 and it is owned by 5 municipal waste management companies. The stakeholders cover together 50 municipalities, with over 400 000 inhabitants (Corin, 2018). In the same area, several companies are working within waste management, making the area into a centralized large collaborative complex within the field. The project was initiated by Westenergy, wishing to collaborate with the field of art and design - a relatively new approach for the energy plants communication efforts. Westenergy expressed in their design brief that they wish a 'conversation piece' to be exhibited in the WtE-plants facilities.

The project was a creative process that included research and mapping, a workshop drawing on methods of co-design, two short videos, a photo series and two textile installation. The process is described and divided into three cycles. The first cycle was a workshop organized at Westenergy, with the intention to learn about what happens in the WtE -plant, who are the visitors and what are their attitude towards waste. Through a co-creative workshop, the aim was to sense and explore the facilities of the WtE-plant through different mediums such as creating miniature models. The second intervention was a 'conversation piece' in a physical form, exhibited in the energy plants lobby. The piece was a photo series of the miniature models, exploring visibility and transparency by discussing the role of a WtE-plant in the entire waste management system. The third intervention was a reflection of the past experiences in the form of a textile installation, exhibited in gallery Valo at University of Lapland.

4.1 Research and planning – what should the conversation be about?

The project started with a set of meetings and planning, beginning with a visit at Westenergy in Mustasaari in the end of January 2017. My first notice was that the energy plant was located in an industrial area, in the outskirts of the city Vaasa, thus making it invisible to people's daily life in the city. For the meeting I had prepared questions and a few possible approaches the project could take. I was interested in who visits the plant and the purpose of the collaboration, considering the aims, possibilities and restrictions. As they had requested a 'conversation piece' I was curious what they expected that the conversation should be about. Three representatives from Westenergy were present at the meeting, giving their insights, ideas and thoughts around the topic. We discussed options of an evolving art piece, a template that could be sent to schools, a metal installation, an animation etc. Through the meeting it became clear that the topic, methods and medium of the conversation were still unclear and they were open for suggestions.

During the meeting it was mentioned that the purpose was to give more value to the visitor experience, which was quickly connected in my mind to a service design process. As I learned that the energy plant is visited mostly by young elementary school students, I saw the opportunity to include and engage a visitor group in the project, by using participatory and collaborative approaches in the form of a workshop. Thus extending the conversation into before, during and after the workshop. This idea seemed to get most support from the representatives at the meeting and it was apparent that there was excitement to create a new kind of collaboration.

During the visit I got a tour in the energy plant to learn as much as possible about what happens in the building. A suggestion for the possible exhibition space was presented. The space was in the company's modern lobby, with large windows, white high walls and ceiling. I documented the visit by taking notes and photographs. It became evident that the modern energy plant was putting a lot of effort into communicating and educating about what happens in the plant. However, this educational aspect was not visible in the modern facilities, other than in the auditorium space. Consequently I was questioning if a person visiting the area or the plant would understand what happens within the building and all of the aspects in which it is functioning.

In the meeting I got to learn about two specific issues that the energy plant is dealing with. Firstly, the customers are not sorting the waste well enough, which results in a lower energy value. The lower energy value leads to higher waste management fees for their customers. Therefore, everyone would profit if the waste would be sorted better. Secondly, customers are confused on what actually happens in the energy plant and what is its role. Neither is it clear for people who benefits from a WtE-plant. People tend to place quick judgements and think that the energy plant would be taking the waste for their own profit. This I learned not to be true and it can be explained by the business model of the municipality owned waste-to-energy plant, which is not aiming for profit, only to pay off the initial investments (Corin, 2018).

Understanding this made me question my own assumptions and judgements, which were naively focusing on the idea that to increase the material recycling would be the only reasonable aim, and that combusting waste is a waste of valuable resources. Yet, I learned that the modern energy plant was working at the heart of a circular economy and dealing mostly with non-recyclable and often hazardous waste. They are improving recycling collaborations continuously, while following the strict environmental laws to clean and minimize the emissions.

A fear of mine was to be lost in the enormous topic of waste management, which could be dealt with through so many aspects and in many ways. Despite an interest in topic of recycling, circular economy and waste management, I was still an outsider to the topic and lacked industry specific knowledge about what is happening in the energy plant. With a lack of knowledge in the topic I considered it as an opportunity to examine the context as an outsider and a visitor, and using my assumptions, which are based on my own value system and previous experiences, as an input into the visitor experience.

4.2 Cycle 1: What happens next? – Documenting a Waste to energy plant

After the meeting I created a first draft of a project plan. I suggested to deal with the problem of sorting waste together with a group of school children, considering ways how to make it more fun and easy to sort waste. The feedback, however, was that it would be better to focus on Westenergy's own practice, since recycling and sorting waste is not directly part of their practice, even if they would benefit from it. Therefore, the focus shifted into visualizing

Westenergy collaboratively, to gain a better understanding about their practice. After feedback from my supervisor the focus was extended to include educational aspects. The main idea was to try to imagine ourselves in the group as problem-solvers, drawing on design education and design thinking, I aimed to investigate the role of a WtE-plant in the whole waste management system and how to visualize and understand it better through a collaborative practice. Thus it lead to questioning how to visualize something that is happening in the building but is not visible now. Considering what happens in the WtE-plant it is obvious that they are maximizing the value of waste by capturing the energy trapped in the waste. On the energy level it is a great example of a circular economy, where the energy is circulating continuously, creating a loop. However, this lead me to question what other values could be captured from waste. I realized the potential to explore social and educational values, which had also been considered at the energy plant and evident in the communication efforts and existing educational material. Additionally I was considering what kind of value is being wasted, when not utilizing the valuable knowledge of the visitors in developing the communication and transparency initiatives. Considering this aspect might lead to new point of views and understanding on how the conversation should be held, where and by whom.

The workshop was organized with an explorative attitude, where critical design was evident in the thought process, directed at the design itself. It was about questioning every decision and preparation, such as budgeting, ideation, arranging transportation and lunch and requesting prices from several companies, choosing material, planning documentation and making a script for the workshop. The critique itself was not an inclusive act. However, inclusion was directed at documenting, collecting and producing data in the form of photography and miniature models. The workshop offered the opportunity to collect evidence of how people interact in this environment and with the given material. Additionally, the workshop concretized an interaction and an opportunity to reflect ideas of inclusion, place and time.

While organizing the workshop, a guiding question was who should be included, how and why. I considered that the final work should not just reflect purely my ideas, but rather highlight the visitors point of views. To emphasize the aspect of inclusion on voluntary basis, was important for democratizing the ownership and to respect locality and give everyone a fair chance, an invitation was sent to all, over 200 elementary schools in the company's operation area. The invitation stated that the first school class that replies, can participate in a workshop at the waste to energy plant, free of charge with lunch and transportation included

as an encouragement. All of this was planned in the budgeting. The invitation got several replies, and the first to reply was from a 3-4th grade class teacher from Tuiskula elementary school, located in Kurikka. The feedback for this approach was extremely positive and finding the participant class happened without any issues. According to the teacher, the fact that the visit was free of charge was the main reason why they were willing and able to participate. Thus, organizing a similar workshop would perhaps require similar incentives.

Figure 4. Documentation of tour in a waste-to-energy plant. (Photographs by Anu Corin)

The following question was about how the students could be engaged in designing the visitor experience. After considerations I decided to use the structure of design thinking, which is taking a human-centered approach. Design thinking is offering methods which could be adapted into several contexts and it functions as a useful guide for a design process. I developed a design brief for the students and gave them the task to visualize what happens in the waste to energy plant. Starting from explaining what design is, I asked the help of the participants. Through this I aimed to emphasize the visitors as problem solvers and experts in the visitor experience, representing all the visitors at the energy plant. By encouraging to paying attention to what goes on in this building, I requested to capture what is most interesting and documenting that with a camera. Eventually the purpose was to build miniature models or prototypes of the energy plant, the idea was to work with our hands, as an attempt to understand and remember the experience better though repetition. These students will be the future problem solvers, therefore they should be taught proper design tools for creating a sustainable future. I used Kenttälä's (2007) book "Muotoiluiloa" as inspiration as it aims to guide teachers in design education for young students. By teaching about the design process, raising curiosity and excitement about how our everyday objects and processes function, it is striving to form an understanding that there is a possibility to affect what our objects look like and how they function. By choosing to use the structure of design thinking (Brown & Katz, 2011) when planning the workshop, I aimed to raise the question of would we have a better relationship to objects if we were taught design in elementary schools.

The following structure was used as a base of the workshop:

- **Empathize**: In this phase the 13 students got a tour in the energy plant. They were divided into 4 groups, and each group was given a camera for documenting. The students seemed very excited about the tour, and the security measurements added an extra dimension to the experience as everyone needed to wear helmets, headphones and vests.
- **Define**: After the tour we went through the photos together and discussed what did we actually see, hear and experience.
- **Ideate**: We wrote all our ideas on post it notes and started sketching with pen and paper and discussing the ideas in groups.
- **Prototype**: The final ideas were selected together and prototypes were built collaboratively out of waste material, with the help of me and the students teacher.

- **Test**: In the end the prototypes were tested and presented to the other groups. Altogether the miniature models came together on time and with a lot of imagination. The students were true “out of the box” thinkers noticing small details in the energy plant and larger structures and even created a way how the separate miniature models could function together – creating a chain of actions happening in the energy plant and even some improvement ideas. The exercise proved that they had memorized even small details from the WtE-plant, and also understood bigger processes and how they connect.

The same structure could be identified in my own design process. I started by empathizing and learning about Westenergy’s practices. Following by defining the problem, which I identified to be the lack of awareness of the role of a WtE-plant in the waste management system. After this I ideated about how the WtE-plant could be visualized collaboratively. The workshop could be considered a prototype of a concept. Finally the concept of how to create awareness of the invisible spaces of material flow was tested and presented in the form of an exhibition, which is discussed in the following section.

Figure 5. Photographs taken by workshop participants, documenting what they saw at the energy plant. The only guideline provided was to document what you and your group finds most interesting. The visual material produces a map of what was visible and what caught the young visitors attention. Here is a selection of 4 photos, of altogether 36 photos, that are further categorized and analyzed in Chapter 5.

Figure 6. Documentation of workshop exist in the form of photos, videos, stop motion video and voice recordings of the workshop. (Photo by Anu Corin)

Documentation placed another challenge on the workshop as the workshop was facilitated alone. To both receive help and emphasize and include the viewpoint of the participants, the workshop was designed to engage the participants in collecting data, through observing and photographing. Another consideration was to include one more person to help with purely documenting. However, due to the distance and short time frame, I chose to use my own camera and placed another camera on a tripod to take stopmotion photos of the entire

workshop. I learned that workshop facilitation takes up most of the attention, leaving less attention to documenting, taking photos, observing and discussing, unless it has been well structured.

As a critique I point out that the research is lacking in structured feedback from participants, which could have given more insight into the participants perspective. Yet, the outcome was on a more subjective level, creating a set of visual material to be interpreted. To document something that is invisible, but should be highlighted will always need an interpretation. The value of this data is therefore in how it is described, categorized, summarized and which connections are made. It is, however, impossible to know on a long term how the workshop affected the students. Though the initial aim was to give the participants a better understanding of the WtE-plant, yet, it had an impact on me as a researcher as I turned out to be the one learning through the interaction with the participants.

4.3 Cycle 2. Point-of-view – Communication through object

Point-of-view is the second cycle of Waste to value -project, realized during spring-summer 2017. The aim was to materialize a 'conversation piece' based on the data collected in the previous workshop. This part of the process explored object based traditions and polarities such as visible and invisible, material and immaterial qualities. Through the process I explored and experimented with ideas of how an object could be part of a conversation and do we need a physical object to represent certain ideas or could the object be the workshop itself, imagining a 'conversation piece' as an immaterial process. I further considered my responsibility in relation to the workshop participants and to Westenergy, for example by bearing in mind that the space should be used responsibly with respect to the employees, who will every day be affected by the object which I decide to place there.

Critical design offered the methods and theory about communicative objects (Malpass, 2017; Jakobosone, 2017; Dunne & Raby, 2013). It gave the possibility to further investigate the context and raise questions, rather than give answers, through considering for example material choices, placement and space, permanent or temporary and how to exhibit the object. I chose to use the data collected in the first workshop and show documentations of the miniature models made by the elementary school students, to highlight the point of view of

younger generations, adding a dimension of the future to the discussion. This choice was made when looking back at the data produced in the workshop, I realized that it is the workshop itself that is the real 'conversation piece', and this should be represented in the physical form. Not through making a new 'piece' alone, but through using the existing material as much as possible and in a fair way and create a representation of it. I consider my part as collecting the evidence of the workshop and show possible visitors and viewers that it happened. Through decisions about material choices, time, space, placement and how to exhibit it, I gave my own point of view into the discussion, striving to create more layers of interpretation, while further investigating the subject.

Material choices: The miniature models were photographed and printed on plywood. Through considering what happens to the objects after they have served their purpose, I chose to use wood as a material. The biodegradable, natural material is to ensure that the material can be returned back to where it came from, to create a loop in the biological cycle. This is aiming to consider whether waste is waste still waste when it has been given new value, how WtE-plants look like in the future, whether they will exist and whether waste can be totally designed out from the society.

Figure 7. Photographing the miniature models, made by the students. Photo by Anu Corin

Figure 8. Point of view. Highlighting the kids point of view, representing the future. Questioning whose voice should be heard, and who should the communication be direct to when it comes to waste management and creating new objects? What kind of legacy a are we leaving behind?

Permanent vs. temporary: The choice to exhibit photos of the miniature models, and not the physical models, was due to the fact that the participants wanted them for themselves, to be able to create their own exhibition at their school. Additionally, by exhibiting photo documentations of something that once was, I wanted to try to look at the documentation as if I would be looking at a historical documentation. This raised questions such as what am I leaving behind as a designer? Is it right for a designer to create permanent objects into a changing world? With what right am I deciding what should exist and what should not? With what right am I using material as a designer to express my ideas? I chose to create a temporary object that can biodegrade without adding pollution or perhaps even turned into energy when it is no longer relevant or at the end of its lifecycle. Nevertheless, the experience of the workshop could to some extent be considered permanent, as everything we experience is contributing to our value system. These realizations places an enormous responsibility on the designer. When something is created, it is no longer in the hands of the designer how it is interpreted, therefore it is impossible to know what kind of meanings it will contribute to, how it will be understood and what it will lead to.

Space and placement: This intervention included considerations about public space and whose ideas and point of views should be made visible. As the space will affect the employees everyday life, it should take into consideration their aspects (Baca, 1995). This ruled out exhibiting my own personal point of views, thus rather shifting the focus on what is already happening in the building. Yet, the purpose is to create a conversation, therefore the piece should not state merely the obvious and what is already known. It should provoke to consider the legacy that we leave behind and rethink the concept of waste, raising questions about how and why waste and waste management could be exhibited and made visible for the public.

Exhibition: By exhibiting the photos in the window, I wanted to highlight the aspect of transparency and emphasize on how important it is for people to see and learn about waste management. This also considers polarities of invisible and visible. On one hand, inviting an art and design collaboration into the otherwise off limits energy plant is in itself an act of communicating transparency. As art and design often has a status of functioning as the critical eye in the society. The openness to methods and critique, shows a modern progressive thinking from the energy plants communication efforts. It shows a sign that there is nothing to hide. However, it is worth mentioning that this is merely a start on this path and making things accessible and visible should be an important strategic goal. The space is still off limits, out of reach and invisible for most people, which is making it difficult to understand the processes

that are included in managing waste. As knowledge is constructed through the mind, matter and action (Knappett, 2005), the tacit understanding of material flows is important for developing a deeper connection to the material world around us and creating an environmental awareness. As physically accessing the energy plant might be an obstacle due to security measurements, perhaps the same knowledge could be transferred through other mediums and channels. These considerations lead to creating two short videos of the miniature models, published in Westenergy's social media. By placing the object in the window, there is a reference to transparency, yet, simultaneously it represents a barrier, which excludes people from the concrete experience. The same could be considered about the communication efforts, which provide a glimpse into the processes yet excludes and remains out of reach. The window also represents the window in the control room, which is the only place in the energy plant, where waste could be perceived by visitors. The window further symbolizes a barrier between natural and manmade structures, a technological space between the societal and natural world, formed by "great technical systems". These systems include for example transportation, production and information, and they regulate "modern society's exchange with nature" (Heidenreich, 2009, p. 1146). The purpose is to point out that these technical systems are hidden from the eyes of most people, exemplified in the fact that the window is looking towards the yard at the edge of a forest, and therefore not experienced by most people. To emphasize the matter of exclusion, the photos can only be viewed from the inside.

Figure 9. Point of view. Exhibited in the lobby of a Waste to energy -plant. Questioning location and environment, who will interact with the objects and for how long. What will the object communicate after 50 years? Will there still be waste in the future and will we still utilize it for our energy production? In the future, could this documentation be considered evidence of what once was?

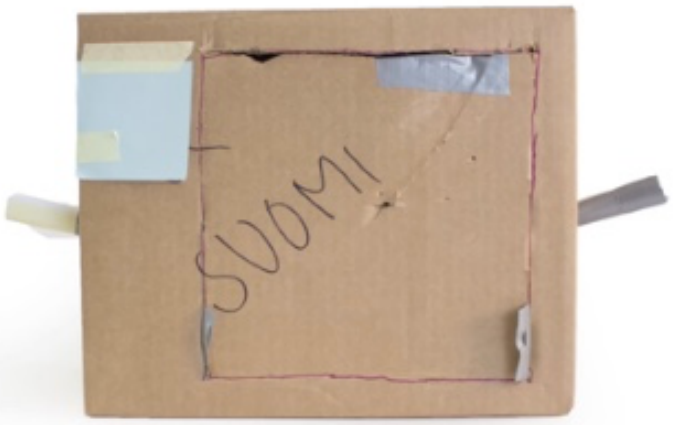

Figure 10. Short video published in the energy plants social media. Asking who's point of view and through what media? Where should the discussion happen and how to reach people?

4.4 Cycle 3. What kind of value – Reflections and materialisation

'What kind of value' is the third cycle of Waste to value -project, created and exhibited in spring 2018. It consists of textile installations, that were exhibited in Gallery Valo at University of Lapland. The textile installations are based on insights collected from the two previous cycles. With reference to mass-production, textile recycling and circular economy, the installations are rethinking the concept of waste and realizing that our current solutions of waste management are temporary. The work is questioning responsibility of recycling and asks what kind of value are we wasting. By choosing to work with textile I want to draw attention to the lack of functioning textile recycling systems.

Through the process I was aiming to visualize the complexity of designing for sustainability, pointing out how meaningless it feels to produce something which is not valued. The object below is named "1 unit of energy", playing with a speculative design idea of what if we are creating objects that are appreciated because of their energy value. Of the entire life cycle of

an object, only a small part might be active use, thus I want to question the purpose of creating more objects into a world that is drowning in objects and waste. In this work, textile functions as a symbol of wasteful consumption behavior, referring to events, where textile manufacturers were caught having combusted new, unused products.

I wanted to try to create something by my hands of a familiar material, to get a better understanding of material through the process of making, touching and feeling. The focus was on material experience and tactile knowledge, by adding an element of embroidery I wanted to refer to value of handicraft, symbolizing the act of slowing down, questioning the value of the production, skills, craftmanship and people who made the product.

Additionally, the textile installation is highlighting the educational aspects, questioning whose role it is to educate us about the material flows of our society and who should make these invisible spaces of material flow visible. The text “we are all just visitors” is aiming create awareness of the legacy of what we leave behind us. Simultaneously, it is asking what kind of power do we have to contribute to a sustainable future. By pointing out that we are here for a short temporary time, visiting, and like materials, also people are in a continuous flux, changing, adapting and becoming (Ingold, 2011).

Figure 11. "1 unit of energy", Exhibited at University of Lapland, Gallery Valo in April-May 2018. Symbolizing a product that, due to its short use, is essentially destined to become energy. Are we actually designing products to become part of our energy production? The object is designed to question the purpose of production. It is referring to events in fast-fashion and textile industry, where unused and unsold garments have been combusted rather than recycled.

Figure 12. "What kind of value" is referring to the value of making and to the material itself. How much time and effort does it take to make a product? Are we valuing the skills it takes to create a product? What is the value of seeing and touching when it comes to understanding? Exhibited at University of Lapland, Gallery Valo in April-May 2018.

Figure 13 Images of "what kind of value" textile installation exhibited at University of Lapland, Gallery Valo in April-May 2018.

5 Discussion & analysis

To analyse the collected data, I organized and grouped it into photos, video and objects produced by me and photos and objects produced by workshop participants, consisting of a group of 13 elementary school students and their teacher. The data was mainly collected by me, both as a researcher of a phenomenon, but also as a research subject. These different types of data were further categorized into themes. By identifying certain overlapping themes and reoccurring subjects, patterns were identified together with findings in the literature review. The discovered themes in the data were also giving ideas for the literature review.

Through the process I identified 4 reoccurring themes in the collected data. Each theme is based on data produced and collected myself, validated through reflection on data produced and collected by workshop participants. Beyond the images the following reflections are built around theories and discussions presented in the literature study. The categories function as evidence, which are backed up by relevant literature.

5.1 Perceiving the invisible

For a visitor, the first experience of the energy plant is its location. A centralized waste management area, in the outskirts of a city, where outsiders will hardly go, unless there is a specific reason for it. Therefore, much of the important work happening in the area is being unnoticed. Nevertheless, the work is significant for the areas waste management system. Around 400 000 people are experiencing the benefit of the work. Yet, this benefit is mostly experienced indirectly in forms of warmth, electricity and cleanliness (Anusas & Ingold, 2013; Heidenreich, 2009).

In the collected data, several photos are showing pipes and tanks, surrounded by concrete, metal and large glass windows (Heidenreich, 2009). The energy plant is a space where a human is most likely humbled by its own inventiveness and technological skills. It is a true masterpiece of engineering and human resourcefulness. Yet, human qualities are not seen. Also the uncomfortable truth of waste is hardly visible, even though it is the core of the whole building. The massive heaps of waste is only visible through a large window in the control room. Which was apparently a memorable sight as it was photographed and repeated in several of the built miniature models. Perceiving the waste amount is understandably making an impact, as it is emptied in a large chamber directly from the garbage collector with familiar logos. This gives a connection between the waste produced in homes to the following step, which is not seen by most people and answers to questions about what happens next.

During the tour in the WtE-plant a bicycle was photographed by me and two workshop participants. This pattern caught my attention. I consider that the bicycle was drawing attention due to the element of surprise in finding it in a place where once would not expect to find one. It also represents a familiar object in an otherwise unfamiliar place, creating a human element and humor in a surrounding constructed of metal pipes, concrete and tanks. This could be interpreted as a an exception, thus confirming the unfamiliarity of the majority in the surrounding.

Figure 14 Bicycle documented at waste-to-energy plant, representing element of surprise and the human element in an otherwise unfamiliar environment. Photos by Anu Corin and workshop participants.

Another point is that none of the students chose to recreate these pipes and tanks in the miniature models, despite the fact that everyone had photographed this. This indicates that this part of the WtE-plant might have been experienced as hard to understand. It is however through these pipes that the hazardous emissions are cleaned and understanding this is important for communicating the role and purpose of a WtE-plant. The WtE-plant is using world leading clean technology to clean the emissions. These sustainability efforts are not visible in the energy plant, and would be overlooked unless communicated verbally. As people learn through different ways, a verbal communication is hardly enough and a visual representation would support the communication effort. These manmade structures are an important part of creating a cleaner future, therefore it offers an opportunity to experience sustainability, gives a positive attitude to sustainability and a belief that a change is possible.

From a cultural aspect these images are confirming Heidenreich's (2009) discussion about invisible technical spaces of material flow, showing an interesting contradiction between environmental alienation and fixation to material in the form of objects. On one hand we are so involved with material through objects, yet disconnected with the material qualities and environmental consequences. Through involving the people working in the WtE-plant, I want highlight that it is important to actively communicate about the motivations and reasons of a WtE-plant and create opportunities for people to engage with the WtE-plants.

5.2 Transparency and education

Transparency was a reoccurring theme and what already is happening in the building was highlighted throughout the process. Art and design can function as a critical eye in the society, thus the existence of the project is evidence of a modern multichannel communication reflecting an open approach for discussion and development. An art and design collaboration is therefore an opportunity and a symbol for a desire to develop, be open and discuss. It also shows the desire of increasing new cross disciplinary collaborations, which are important in developing a functioning circular economy in more than one way.

The project is not only visualizing the energy plants engagement and collaboration with schools – but also considering the role of an energy company as an educator. The educational work such as informing citizens and communicating the role of a WtE -plant is an important aspect of revealing hidden spaces of our technical system. Yet, the educational work is involving some ethical considerations about leaving the communication efforts only to the energy company, raising the question if other institutions should be more actively engaged in the communication efforts of material flows. For a broader and deeper understanding of the technical systems, the tour could be designed for educational purpose with visual educational material along the route. Another possibility is to visualize the system though media and bring it closer to peoples everyday life. Through art and design is possible to systematically visualize and create opportunities for people to experience the hidden spaces of material flow. Though this work is already an important part of the operation processes. A person who walks into the building would not know that they invest both time and energy into communicating and educating young generations.

Researching what happens to waste on a local level lead me to an understanding that these manmade systems and structures are temporary and under a continuous development. As the very core of the WtE -plant is to function as a temporary solution to waste problems, where the materials are utilized to a maximum degree. Collaborations already exist between different stakeholders that aim to recycle as much as possible, while a constant drive to recycle more is pushed by different agencies, restrictions and laws. By centralizing the waste management systems into one area it supports the different parts of it to collaborate more efficiently, though on the downside this centralization might lead to a sense of disconnection to their processes to people who are not looking from the outside.

An important learning outcome is that the energy plant is offering a temporary solution to the waste problem and the transitory idea was built into the business model. Nobody was claiming that combustion would or should be the only way to manage waste. Yet, through analyzing my own work it is evident that I did not understand about the complexity of the issue, nor the full scale of the possibilities that were given through the possibility to collaborate. The work rather shows my own presumptions, attitudes, fears and concerns connected to the subject, which could perhaps be used as a starting point for further research.

5.3 Tacit knowledge through material experience

Though the workshop aimed to research attitudes towards waste, it lead to exploring the role of engagement in understanding a WtE-energy plants complicated processes and driving forces. This project was investigating a different way of communicating, understanding, remembering and knowing by touching, making, seeing and feeling - discussing the impact of an invisible material flow and making invisible processes visible. I was considering if touch can create a relationship with the material, and therefore create a deeper connection to our environment. The project lead to an insight that these understandings are deeply individual and personal. The “properties of materials, regarded as constituents of an environment, cannot be identified as fixed, essential attributes of things, but are rather processual and relational. They are neither objectively determined nor subjectively imagined but practically experienced” (Ingold, 2011, p. 30). Thus, it is the practical experience of a material that matters. As a designer, it is therefore possible to create opportunities to experience material and technological processes, to help the understanding of invisible material flows.

Figure 15 Understanding happens through mind, matter and action. Evidence of a processed experience. (Photo: Anu Corin)

The images above show a perceptual and material experience. Through the window in the photo the students are looking at a massive amount of waste, produced in the area where they live. Perceiving this, apparently made an impact on the participants, as it was repeated in the miniature model. Therefore it shows that the process did lead to an understanding of the processes. However, this understanding might not make any significant impact, but perhaps plant a seed together with other actions for the future understanding of the material world.

Nevertheless, the material experience did have an impact on my own understanding. Through materializing the concern of designing yet another object into a world that is drowning in objects, the aim is not to merely make commentary but suggest to critically rethink about what is worth producing and good enough for using valuable material. This also concretizes the paradox of using material for criticizing material use. This contradiction is a case in point, and to materializing the problem of creating for sustainability could be considered a paradox. Yet, my question is whether material is really needed for making a point. In this case the material and the action of creating functioned as a concrete vehicle, which together with the literature review was moving the thesis research forward. Categories and subjects presented in the thesis have emerged from this interaction between mind, matter and action.

As Jakobsone (2017) claims that critical design could offer personal development in thinking, I too experiences a development in my thought-process. A first, somewhat, narrow ideological mission led to a new kind of understanding of the topic as I began to see diverse connections and understand relationships in a new way, which no longer was limited to my previous beliefs.

6 Conclusions

It is easy to agree with the idea of humans being part of nature. By spending time in nature we can develop a deeper connection to it, which makes us more likely to want to protect it. However, our environment also consists of processed and synthetic materials, complicated systems and a massive amount of waste, which due to their environmental impact has been made to symbolize the destruction of our natural world. To create a better relationship to the environment, it is important to highlight that we are not outside of our manmade structures, however uncomfortable the truth may seem. Therefore, humans need to embody new narratives of how to be part of this material world, by recreating an excitement of human inventiveness.

This study is focusing on deepening the understanding of the relationship between human, material and the environment, by exploring hidden meanings, through a critical design process. Environmental concern worked as a driving force, but the aim was to provide a description of the social and environmental issues, focusing on issues of waste management, materiality and connected design for a sustainable future. In this thesis, the purpose is not to produce art or design, but rather to expand the understanding of a phenomenon and explore opportunities to design for a sustainable future through a creative questioning process. The aim is not to solve a problem, but to describe it and create possibilities for further action.

A reason to environmental alienation is that parts of the material flow are invisible to most people and therefore difficult to trace. This blindness depicts a cultural perception of modern exchange with nature, and forms one of the biggest challenges of sustainable development. A lot of effort has been made through information and education, to create more awareness. Yet, environmental knowledge remains abstract when it is not connected to sensory perception and it can only be turned into environmental behavior, when it is connected to “concrete experience and sensual perception” (Heidenreich, 2009, p. 1153-54). Design can therefore contribute to creating a relationship to the environment, through systematically producing awareness of things that have been left unseen in the society and by creating opportunities to explore, sense and experience the invisible spaces of material flow.

Through a collaboration project between University of Lapland and Westenergy, waste-to-energy plant located in Western Finland, the thesis is identifying invisible spaces of material flow and discussing how they could be communicated, made visible and understood. Though the initial aim was to create more value to a visitor experience, by making and exhibiting a 'conversation piece' the project expanded and ultimately lead to researching the framework and the context of waste-to-energy plants in relation to art and design. It can function as a pilot project, answering the question of why waste-to-energy plants should be discussed. Within this project the conversation was happening between University of Lapland, co-students, teachers through presentations and representatives of Westenergy, and additionally within the group of workshop participants and their support network. On a larger societal scale the discussion was widespread and multichanneled, connecting to complex societal issues, political climate, education and waste management systems. This implies that the entire project was a 'conversation piece' and not only the produced objects.

The collaboration project is including three creative processes, each building on the previous one, functioning as a vehicle for the research. The process and practice-based approach is combined with object-based traditions, reflecting on the role of making something with your hands when it comes to understanding. Through engagement it was possible to imagine and create a space for potential discussions, leading me to a deeper connection to my here and now.

Through taking a critical approach, my intention is to highlight growth and development opportunities. Critical design gave the method and theory for researching the context and develop my own thinking as a designer. The process led me to an understanding that to practice how to think critically can help in discovering issues and to rethinking solutions, which are not limited by our previous experiences and understandings. Thus showing that critical design has potential to be used for professional growth, through stimulating thought and for collecting insights, when developing products, services or strategies.

Recommendations for further research

For further research, I recommend to keep pointing out and creating awareness of other invisible spaces of material flow. The focus could be on developing concrete tools for the purpose. Further research is also needed to gain more knowledge on the benefit of visualizing these gaps, by collecting structured feedback from visitors, researching the variation in thought and gaining statistical information, to build credibility.

Jakobsone (2017) suggests that critical design could be of benefit within design education, where it also has its roots and it has potential to change the way designers think. Through familiarizing myself with the literature about critical design, both positive and negative, I am convinced that despite some well-grounded critique, it contribute to developing the concept of Arctic Design and function as a tool in Service Design, for example in the research stage of a service design process, as it provides rich descriptions and deeper considerations of the context. However, it should not remain as one-off isolated University projects, but incorporated as a way of thinking, also within projects with consumerist motives. Through identifying potential of a professional growth in using critical design, I recommend more research on how critical design could be part of Arctic design and even integrated in the curriculum. A critical design approach could also be of benefit in the context of Arctic challenges and researching complex issues within the area. Critical design could offer a systematic approach for rethinking the norm and reimagining different ways of living, that are less consuming of resources and more conscious in actions.

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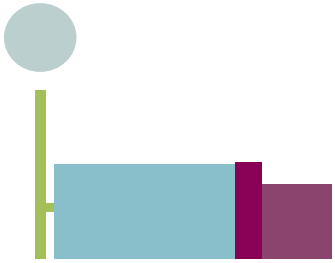
Appendences

1. Workshop invitation



INBJUDAN / KUTSU

VAD HÄNDE SEN? -VERKSTAD
KUINKAS SITTEN KÄVIKÄÄN? -TYÖPAJA

Först anmälda skolklass bjuds in för att spendera **onsdag 24.4.2017** på Westenergys avfallsbränningsanläggning i Stormossen. Under dagen funderar vi tillsammans på avfalls begreppet – Vad är avfall? Varför sorteras det? Och vad menar vi när vi säger att vi ”slänger bort” något? En rundtur i anläggningen ger en uppfattning om vad som händer med vårt avfall idag. I verkstaden skapar vi verk av brännbart avfall och funderar på hur vi kan se värde i materialen. Verkstaden kommer att dokumenteras i form av foto och video, som sedan ställs ut i Westenergys utrymmen. Westenergy bjuder på gratis busstransport från skolan till anläggningen och tillbaka, samt mellanmål och material för verkstaden.

Ensimmäisenä ilmoittautunut koululuokka kutsutaan mukaan viettämään **keskiviikon 24.4.2017** Westenergyn jätteenpolttolaitoksella, Mustasaaressa. Päivän aikana pohdimme yhdessä jätteen käsitettä – Mitä on jäte? Miksi jätteet erotellaan? Mitä tarkoitamme, kun sanomme että ”heitämme pois” jotain? Kierros jätteenpolttolaitoksella auttaa ymmärtämään mitä jätteelle tapahtuu tänään. Työpajassa luomme teoksia poltettavasta jätteestä ja mietimme, miten voisimme nähdä materiaalin arvon. Työpaja dokumentoidaan valokuvan ja videon muodossa, ja dokumentaatiosta rakennetaan myöhemmin näyttely Westenergyn aulaan. Westenergy tarjoaa ilmaisen linja-autokuljetuksen koululta jätteenpolttolaitokselle ja takaisin, välipalan ja materiaalit työpajaan.

PRELIMINÄR TIDTABELL / ALUSTAVA AIKATAULU

10.00 Ankomst till Westenergy med buss / Saapuminen linja-autolla Westenergylle
10.30 Rundtur i avfallsbränningsanläggningen / Kierros jätteenpolttolaitoksella
11.30 Mellanmål, lunch? / välipala, lounas?
12.00 Verkstad / työpaja
14.00 Busstransport tillbaka till skolan / linja-autokuljetus takaisin jätteenpolttolaitokselle

2. Letter of permission

Kuvauslupa / Lapsen tekemän teoksen esityslupa

Keskiviikkona 26.4 lapsenne luokka on kutsuttu osallistumaan työpajaan Westenergyn jätteenpolttolaitoksella Mustasaaressa. Laitoksessa hyödynnetään 400 000 asukkaan polttokelpoiset jätteet, yhteensä yli 180 000 tonnia jätettä, joka kerätään lähes 50 kunnan alueelta. Laaja toiminta-alue kattaa myös teidän kuntanne. Työpajan järjestää Anu Corin, Lapin Yliopiston maisteritason muotoilun opiskelija, yhteistyössä Westenergyn kanssa. Työpajan pohjalta kootaan Westenergyn tiloihin näyttely. Osaksi näyttelyä suunnitellaan ja tehdään yhdessä lasten kanssa pienoismalleja tai prototyyppejä, kuvataan videoita, äänitetään kommentteja, ja pohditaan mitä jäte oikein on.

Kysymme teiltä lupaa käyttää lapsenne työpajassa tuottamia luomuksia, ääntä ja kuvaa osana teosta, joka on esillä edellä mainitussa ja mahdollisesti muissa taidenäyttelyissä ja yliopisto-opetuksessa. Valokuvia sekä videokuvaa toiminnasta ja teoksista, jossa ei näy henkilöitä tunnistettavasti, voidaan käyttää näyttelyn tiedotuksessa ja julkaisussa, sekä Westenergyn nettisivuilla.

Lapsen nimi: _____

Koulu: _____

Rasti kohdat, joihin annatte luvan:

Lapseni ottamia valokuvia, kuvaamaa videota ja tekemiä pienoismalleja saa käyttää osana teosta:	Kyllä _____	Ei _____
Lapseni puhe saa kuulua videolla:	Kyllä _____	Ei _____
Lapseni saa näkyä tunnistettavasti kuvissa/videolla:	Kyllä _____	Ei _____

_____

Huoltajan allekirjoitus